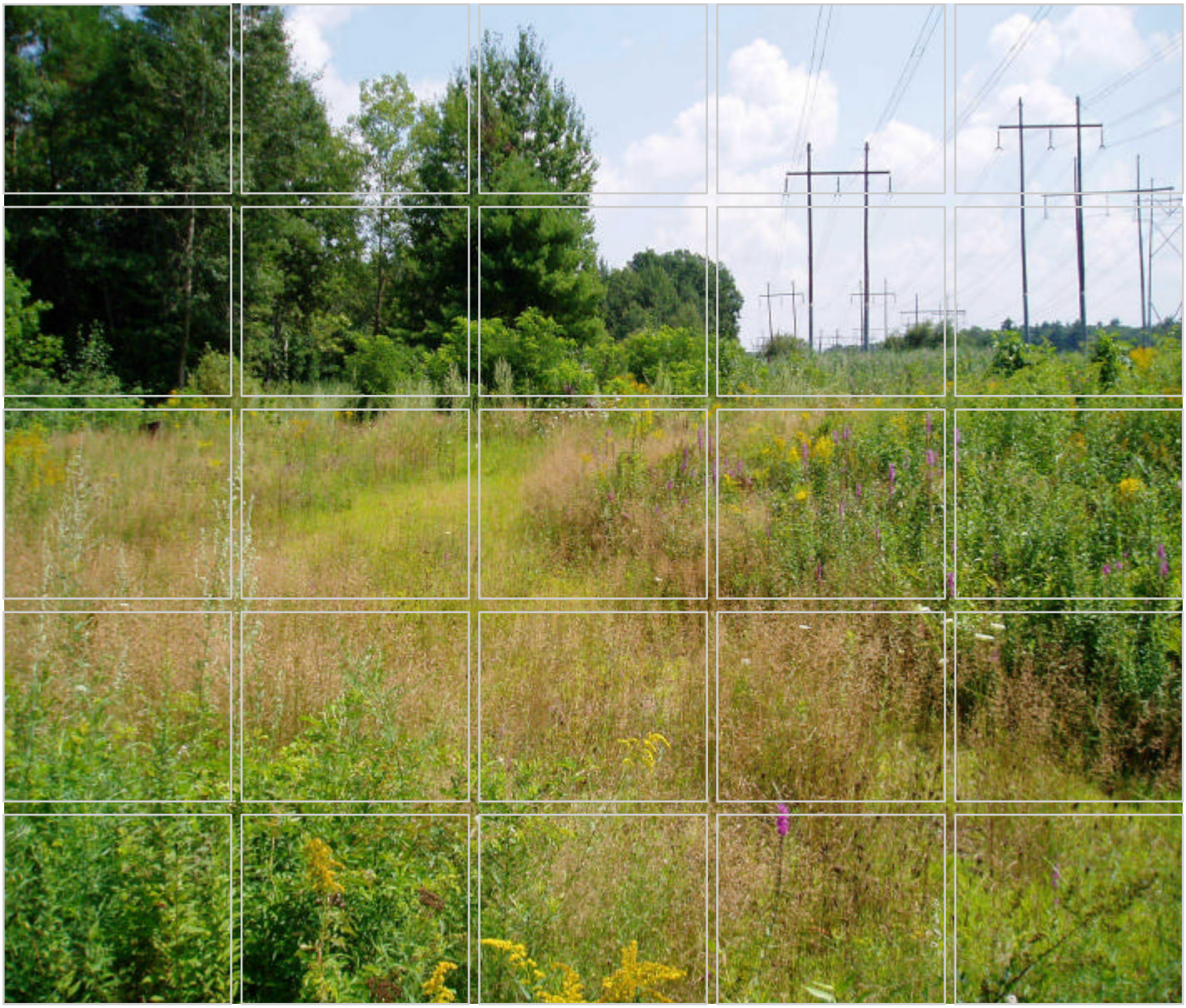

DRAFT FINAL

Feasibility Study

Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

17 June 2004

Prepared for:
Shpack Steering Committee

ERM

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

On behalf of the Shpack Steering Committee (SSC), Environmental Resources Management (ERM) prepared this Feasibility Study Report (FS) to evaluate remedial alternatives at the Shpack Landfill Superfund Site (the "Site") located in Norton and Attleboro, Massachusetts. This report was prepared under direction provided by the United States Environmental Protection Agency (USEPA), as the lead agency administering the Shpack Superfund Site, under an Administrative Order by Consent (USEPA Docket No. I-90-1113) between the USEPA and the Shpack Superfund Site Potentially Responsible Party (PRP) Group.

1.1 PURPOSE AND SCOPE

The purpose of this report is to identify and evaluate remedial technologies to address both source control and management of migration remedial action objectives (RAOs). The results of this FS will be used by USEPA to select a preferred remedy, and ultimately a Record of Decision (ROD).

The FS report was prepared in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986; the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) 40 CFR 300; and the Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA.

Engineering cost estimates have been prepared as part of the FS process. The cost estimates presented in this report were prepared for comparison purposes; actual costs may vary. More detailed cost estimates will be prepared as part of the Remedial Design / Remedial Action (RD / RA). This FS did not include conducting treatability studies or preparation of design documents.

The scope of this report includes the following:

Section 1.0 Introduction

Section 2.0 Identification and Screening of Technologies

Section 3.0 Development and Screening of Alternatives

Section 4.0 Detailed Analysis of Alternatives

Section 5.0 Comparative Analysis of Alternatives

1.2 BACKGROUND

The information presented in this section is summarized from ERM's previously submitted Draft Final, Phase IB Remedial Investigation Report, Shpack Landfill Superfund Site, Norton / Attleboro, Massachusetts, dated 17 June 2004 (RI). The FS is not intended to be a stand-alone report and the RI should be referred to for more detailed information.

1.2.1 Site Description and History

The Shpack Landfill Superfund Site is located in southeastern Massachusetts, within the communities of Attleboro and Norton (Figure 1). The Site consists of a former domestic and industrial landfill occupying approximately 9.4 acres of land. Approximately 3.4 acres of the Site are located in Attleboro and are currently owned by Attleboro Landfill, Inc. (ALI). Approximately 6.0 acres of the Site are located in Norton and are owned by the Town of Norton. The Site is located approximately three miles southwest of the center of Norton. Figure 2 displays the primary site features. The following abut the site:

- North – Former Shpack Residence, Union Road (Town of Norton) and wooded, undeveloped land;
- South – ALI Landfill and Chartley Swamp;
- East – Chartley Swamp and wooded, undeveloped land; and
- West – Peckham Street (City of Attleboro) and ALI Landfill.

Union Road (Town of Norton) and Peckham Street (Town of Attleboro) are the only public thoroughfares near the Site. The population within the immediate vicinity is sparse. An approximately 50-foot wide utility right-of-way containing high-voltage transmission lines crosses the property from southeast to northwest. The geology of the Shpack Landfill generally consists of: non-native, domestic and industrial landfill materials; organic silt and peat; glaciofluvial / glaciolacustrine deposits; glacial till; and bedrock.

The landfill materials are thickest in the western portion of the Shpack Site and thinnest in the eastern portions of the Shpack Site. Organic silts and peat consist of highly permeable, loose organic silt with variable plant fiber content. Glaciofluvial and glaciolacustrine deposits comprise the majority of the unconsolidated aquifer at Shpack and consist of well-sorted fine to coarse sand, silt and gravel. Bedrock consists of very fine to medium-grained, quartz-rich, gray sandstone and siltstone with interbedded coarse-grained conglomerate.

The Shpack Landfill and its isolated wetlands are located in an area of groundwater recharge. However, due to seasonal variability, the interior wetlands may also serve as a secondary groundwater discharge area. The groundwater flow pattern between the ALI Landfill and the Shpack Site involves shallow and deep overburden groundwater flow from the ALI Landfill onto the Shpack Site, near the Tongue Area, and along the boundary between the ALI Landfill and the Shpack Site towards the north and northwest. The discharge point for shallow and deep groundwater is Chartley Pond and its adjacent wetlands.

The Site received domestic and industrial wastes, including low-level radioactive waste, beginning in 1946. The landfill continued to operate into the 1970s. The filled areas where the wastes were dumped are overgrown and entirely enclosed by a chain link fence. The Tongue Area, an unvegetated area containing a variety of waste materials, is located in the southern portion of the Site.

In 1978 the Nuclear Regulatory Commission (NRC) determined that government activities might have resulted in radioactive materials (primarily uranium and radium) being deposited within the Shpack Landfill. Following an NRC investigation, the Shpack Landfill was designated a candidate for the Formerly Utilized Sites Remedial Action Program (FUSRAP). In 1980, the United States Department of Energy (DOE) assigned the Shpack Landfill for remedial action under FUSRAP. Between 1982 and 1984 chemical impacts in groundwater were identified. The site was listed on the National Priority List (NPL) in June 1986. Pursuant to legislation enacted during the 107th Congress on 2 January 2001, House Report 107-350 making appropriations for the Department of Defense for Fiscal Year ending September 30, 2002, "*Section 8143 (a) Activities Under Formerly Utilized Sites Remedial Action Program - Subject to subsections (b) through (e) of section 611 of Public Law 106-60 (113 Stat 502; 10 U.S.C. 2701 note), the Secretary of the Army, acting through the Chief of Engineers, under the Formerly Utilized Sites Remedial Action Program, shall*

undertake the functions and activities specified in subsection (a) of such section in order to - - (1) clean up radioactive contamination at the Shpack Landfill site located in Norton and Attleboro, Massachusetts;…" (Appendix A).

In 1990, a group of potential responsible parties formed the SSC and entered into an Administrative Consent Order (ACO) with USEPA. Between 1991 and 1993, the SSC performed Phase IA of the RI to evaluate and document chemical impacts at Shpack. Between 1993 and 1999, limited investigation activities were performed at the Site. In 1999, the SSC in conjunction with other stakeholders began preparation of workplans to implement Phase IB of the Remedial Investigation. Concurrently, FUSRAP responsibility was transferred from the DOE to the United States Army Corps of Engineers (USACE). The SSC, EPA and USACE are working cooperatively to address both chemical and radiological contamination. On behalf of the DOE, the USACE performed radiological investigation activities at the Site and provided this information to the PRPs for inclusion in this report. ERM's Phase IB RI Report was prepared and submitted in 2004, documenting chemical and radiological impacts at Shpack.

1.2.2 Baseline Risk Assessments

On behalf of the USEPA, Metcalf & Eddy completed a baseline human health risk assessment (HHRA), a Screening Level Ecological Risk Assessment (SLERA) and a Baseline Ecological Risk Assessment (BERA) for the Site. The HHRA and SLERA evaluated both carcinogenic and non-carcinogenic risks to human health and the environment associated with contaminants of potential concern (COPCs) detected in soil, groundwater, sediment, and surface water. In addition, the HHRA evaluated risks associated with radionuclides detected at the Site. A detailed description of risk assessment assumptions, methods and calculations can be found in the SLERA and HHRA.

The HHRA estimated incident lifetime cancer risks (ILCR) and hazard indices (HI) for various scenarios for current risk, future risk or both. With the exception of lifetime exposure to manganese in residential drinking water, the risks estimated for current scenarios were below an ILCR of 10^{-4} and an HI of 1 for each of the exposure scenarios. The risks estimated for future scenarios are summarized as follows:

- ***Recreational User*** – ILCRs and HIs exceeded an ILCR of 10^{-4} and an HI of 1 for arsenic, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, dioxins, lead,

nickel, total uranium, radium-226, uranium-234, uranium-235, and uranium-238 in soil; Aroclor-1254, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, beryllium, chromium and nickel in surface water; and Aroclor-1254 in sediment.

- ***Adjacent Resident*** – ILCRs and HIs exceeded an ILCR of 10^{-4} and an HI of 1 for arsenic, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, dioxins, lead, nickel, total uranium, radium-226, uranium-234, uranium-235, and uranium-238 in soil.
- ***Onsite Resident*** - ILCRs and HIs exceeded an ILCR of 10^{-4} and an HI of 1 for arsenic, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chromium, dibenzo(a,h)anthracene, dioxins, indeno(1,2,3-cd)pyrene, lead, mercury, nickel, total uranium, radium-226, uranium-234, uranium-235, and uranium-238 in soil.

In addition, the risks estimated for future groundwater / drinking water exposure exceeded an ILCR of 10-4 and an HI of 1 associated with benzene, cis-1,2-dichloroethene, vinyl chloride, trichloroethene, benzo(b)fluoranthene, arsenic, barium, beryllium, cadmium, chromium, manganese, nickel, zinc, uranium-234, uranium-235, and uranium-238.

The SLERA identified COPCs in various media that should be carried forward to a BERA in five distinct exposure areas, as follows:

- Tongue Area;
- Combined Fieldland and Shrubland;
- Onsite Seasonal Wetlands;
- Forest; and
- Chartley Swamp (Inner Rung, Outer Rung and combined).

Based on the results of the SLERA, potential ecological risk was not identified in Chartley Pond; therefore, this exposure area was eliminated from consideration in the BERA. In addition, based on the spatial distribution of samples and physical barriers, Chartley Swamp was divided into three exposure areas, as follows:

- Inner Rung – This exposure area consists of data collected from Chartley Swamp in the area immediately surrounding the Tongue Area;

- Outer Rung – This exposure area consists data collected from the remainder of Chartley Swamp; and
- Combined – This exposure area consists of the combined data set from both the Inner Rung and the Outer Rung.

The Draft BERA was completed on 14 June 2004 and evaluates risks posed to ecological receptors at the Site based on analytical data and modeling of impacts to ecological receptors. In each exposure area evaluated, COPCs consist of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and inorganic compounds. In addition, the BERA did not evaluate risk to ecological receptors from radiological effects because radiation standards for human populations are assumed to be protective of ecological populations. The results of the BERA indicate the following:

- ***Inner Rung –*** Potential risk from VOCs, SVOCs, PCBs and pesticides is negligible. Potential risk to semi-aquatic mammals, waterfowl, fish, and benthic invertebrates exists from inorganics.
- ***Outer Rung –*** Potential risks from VOCs, SVOCs, PCBs and pesticides is negligible. Low potential risk to invertebrates and fish exists from inorganics.
- ***Onsite Seasonal Wetlands –*** Potential risk from VOCs is negligible. Potential risk to small mammals, wetland songbirds, and benthic invertebrates exists from SVOCs, PCBs, pesticides and inorganics.
- ***Hardwood Forest –*** Potential risk to small mammals from VOCs, SVOCs, PCBs, pesticides and inorganics is negligible. Low potential risk to songbirds exists for inorganics.

2.0 REMEDIAL ALTERNATIVE DEVELOPMENT

This section presents a summary of the regulatory requirements and RAOs used to develop remedial alternatives for the Shpack Superfund Site. This process was completed in accordance with the NCP (USEPA, 1990a) and USEPA RI/FS guidance (USEPA, 1988), and included identifying:

- Applicable or relevant and appropriate requirements (ARARs);
- Remedial action objectives (RAOs);
- General response actions (GRAs);
- Preliminary Remediation Goals (PRGs);
- Areas and volumes to be treated; and
- Applicable technologies to comply with the above criteria.

The result of this screening is a summary of potential remedial technologies that can be combined to form a remedial solution for the Site.

2.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

This section summarizes the regulatory requirements to be used in the FS at the Shpack Site and identifies the ARARs for the Site. ARARs consist of federal and state environmental laws and regulations that may have a bearing on the remedial actions selected for the site. Site-specific ARARs are presented in Tables 1A through 1I. Compliance with the ARARs is evaluated in Section 4.0 of this report.

2.1.2 ARAR Classification

Four categories of ARARs have been identified for proposed remedial action alternatives:

- Chemical-specific;
- Action-specific;
- Location-specific; and

- Radiological-specific.

An ARAR is classified as "applicable" if it specifically addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the Site. An ARAR classified as "relevant and appropriate" is not directly applicable to the Site, but addresses situations similar enough to apply to the situation presented.

In addition to ARARs, other publicly available criteria, advisories and guidelines pertinent to hazardous substances, site location and remedial actions were evaluated. Non-promulgated criteria, advisories or guidance issued by Federal and State agencies do not have ARAR status; however, they may be considered in determining necessary cleanup levels for the protection of public health or the environment. These criteria, advisories and guidance are classified as "to be considered" (TBCs). A summary of each category is provided below.

2.1.3 Chemical-Specific ARARs

Chemical-specific ARARs set health or risk-based concentration limits or limitations in environmental media for specific hazardous substances. These requirements are generally used to help set protective cleanup levels for chemicals of concern in designated media. If a chemical has more than one ARAR, the more stringent requirement is typically considered the ARAR. Potential chemical-specific ARARs identified for the Site are listed in Table 1.

2.1.4 Location-Specific ARARs

Location-specific ARARs restrict the concentrations of hazardous substances or the type of activities conducted at a site based on the site's location. Potential location-specific ARARs identified for the Site are listed in Table 1.

2.1.5 Action-Specific ARARs

Action-specific ARARs are those requirements associated with the remedial actions under consideration for the site. These ARARs generally set performance, design, or other similar action-specific controls or restrictions on particular kinds of activities related to management of hazardous substances. Potential action-specific ARARs identified for the Site are listed in Table 1.

2.1.6 Radiological-Specific ARARs

Radiological-specific ARARs are those requirements that are unique to radiological compounds. Potential radiological-specific ARARs identified for the Site are listed in Table 1.

2.2 REMEDIAL ACTION OBJECTIVE (RAO) DEVELOPMENT

Remedial Action Objectives (RAOs) have been developed for various media at the Site to be protective of human health and the environment based on the results of the Remedial Investigation and Risk Assessments. The RAOs identify the media, COPCs, exposure routes, receptors and preliminary remediation goals for each exposure route.

2.2.1 Remedial Action Objectives (RAOs)

The media of concern to be evaluated under the FS were identified based on the results of the baseline human health and ecological risk assessments for the Site. The estimated human health cancer risks and non-cancer hazard index (HI) for soil, sediment and groundwater exceed the USEPA target risk range of 10^{-6} to 10^{-4} and HI of 1. Therefore, response actions are necessary to protect human health and the environment. The RAOs for the Site are presented in Table 2.

2.2.2 General Response Actions

General response actions (GRAs) are site actions that will satisfy the RAO requirements. GRAs have been defined for each media. The GRAs that have been considered for this site include:

- No action / institutional controls;
- Collection;
- Treatment;
- Containment;
- Consolidation;
- Excavation; and
- Disposal.

The GRAs for the Site are presented in Table 2 and are discussed in further detail in the following sections.

2.2.3 Preliminary Remediation Goals (PRGs)

Preliminary Remediation Goals (PRGs) are compound-specific and site-specific standards established to be protective of human health and the environment consistent with the established RAOs. The PRGs for all media were developed based on:

- Non-carcinogenic risk set at an HI of 1;
- Excess Lifetime Cancer Risk (ELCR) factors of 10^{-6} and 10^{-5};
- ARARs;
- Background concentrations; and
- ResRad Modeling.

To ensure compliance with 105 CMR 120 and a dose of 10 millirem (mrem) per year, risk-based PRGs for radionuclides were modeled using ResRad. The results are summarized in Appendix B.

PRGs are used in the FS process to develop and evaluate remedial alternatives. Because PRGs are based on the results of the HHRA, PRGs have only been developed for those compounds contributing to future risk at the Site as listed in Section 1.1.2. PRGs for the Recreational Scenario, Adjacent Resident Scenario, and Onsite Resident Scenario are summarized on Table 3.

2.3 IDENTIFICATION AND SCREENING OF APPLICABLE TECHNOLOGIES

This section identifies and screens potentially applicable remedial technologies for the Shpack Superfund Site. This process was performed in accordance with the NCP and the USEPA RI/FS Guidance to identify remedial technologies that meet the RAOs for the Site. This screening process is intended to develop the list of remedial technologies that can be implemented at the Site.

Technology performance and applicability is evaluated relative to both site-specific and waste characteristics. Site characteristics include site geology, hydrogeology, and terrain; availability of space; and resources

necessary to implement the technology. Waste characteristics include contaminated media, types and concentrations of waste constituents, and physical and chemical properties of the waste (e.g., oxidation / reduction state, solubility, and mobility). The technology screening process reduces the number of potentially applicable technologies by evaluating each technology as to its:

- ***Effectiveness*** in providing protection to human health and the environment and to the reduction in toxicity, mobility, or volume of the waste;
- ***Implementability***, as a measure of both the technical and administrative feasibility of constructing, operating, and maintaining a remedial technology; and
- ***Cost***, as compared to other technologies.

Feasible technologies surviving this initial screening process are used to develop potential remedial alternatives evaluated for the Site.

2.3.1 Groundwater

Based on site-specific conditions, groundwater remediation is infeasible at this time from a Cost, Effectiveness and Implementability perspective based on the following:

- ***Proximity to a Significant Offsite Source*** – As documented in the Phase IB RI, chemically impacted landfill materials from the ALI Landfill extend onto the southwestern portion of the Shpack Site. Monitoring well ERM-107M is located on the ALI Landfill and contains the highest concentration of VOCs in groundwater detected during the RI. Specifically, this well contains concentrations of VOCs that exceed ARARs. This monitoring well is not located on the Shpack Landfill but is hydrologically upgradient of the Site and indicates that a significant VOC source is located beneath the ALI Landfill. Because of this, groundwater remediation (i.e., pump and treat) would be ineffective because a significant source of groundwater contamination remains unaddressed. Due to the proximity of an undefined, unaddressed source area beneath the ALI Landfill, and direction of groundwater flow from ALI onto Shpack, compliance with groundwater ARARs is infeasible at this time. Until this offsite, upgradient source is adequately addressed, groundwater remediation at Shpack would be ineffective.

- ***High Probability for COPC Partitioning*** – Due to the high organic carbon contents of shallow aquifer sediments, the majority of contaminant mass is likely adsorbed onto aquifer solids, limiting the effectiveness of groundwater restoration. The high contaminant sorption onto soil and sediment inhibit contaminant movement in the aquifer and would increase the restoration timeframe for groundwater remedial activities.

Only alternatives that are protective and meet ARARs can move forward to the Detailed Analysis. Based upon the above discussion it is clear that ARARs cannot be met and therefore, protectiveness cannot be achieved in groundwater, primarily due to the presence of unaddressed off-site sources. Based on these considerations, groundwater treatment cannot be effectively addressed at this point in time. Therefore, groundwater remediation options have not been carried forward in the FS.

2.3.2 Source Control (Soil)

Table 4 includes a summary of Process Option Screening performed for Source Control (i.e., soil) at the Site. Process Option screening evaluates the degree to which remedial technologies are capable of treating contaminants detected in soil on Site. If a remedial technology is not capable of treating site COPCs, then it is eliminated from further consideration.

Table 5 includes a summary of the cost, effectiveness and implementability evaluation performed for remedial technologies surviving the Process Option Screening displayed on Table 4. As shown on Table 5, three remedial options are carried forward for consideration in the FS, as follows:

- No Action / Institutional Controls;
- Containment (Capping) with Consolidation; and
- Excavation / Off-Site Disposal.

2.3.3 Sediment

Consistent with the RAOs for sediment, activities will be taken to prevent exposure to sediment that presents an unacceptable risk to human health or the environment.

2.3.4 Surface Water

Consistent with the RAOs for surface water, activities taken to address other media will prevent migration of contaminants from the site to surface water to the extent practicable.

2.4 AREAS AND VOLUMES TO BE TREATED

For each of the primary risk scenarios provided in the HHRA (Recreational User, Adjacent Resident, and Site Resident), soil and sediment volumes that require remediation were calculated and mapped. To accomplish this, the chemical and radiological analytical results provided in the RI were compared to the Site PRGs. Sampling locations that contained COPCs exceeding Site PRGs are considered to require remediation.

The radiological samples used in this process were those collected by the USACE. In order to be consistent with the areas and volumes used within the draft USACE Engineering Evaluation and Cost Analysis (EE/CA) (Cabrera, 2004), the remedial area associated with each sample location with radium or uranium exceeding Site PRGs is considered to be 20 meters by 20 meters. The associated depth of each area is the maximum depth at which a radiological PRG exceedence occurs at that location. Pursuant to legislation enacted by the 107th Congress, the USACE is authorized to clean up radiological contamination at Shpack.

The locations with chemical concentrations were not completed on a grid pattern. Therefore, to determine the area associated with each sample location that has a PRG exceedence, an approach based on average sample density was used. The average chemical analysis sample density was calculated by dividing the total site area by the total number of sample locations, giving an average sample density of approximately 1 sample for each 7,450 square feet of the Site. As a result, the estimated average size associated with a chemical PRG exceedence is considered to be 30 meters by 30 meters. Again, the associated depth of each area is the maximum depth at which a PRG exceedence occurs at that location.

The following Figures, Tables and Appendices support the remedial volumes and areas:

- Figure 3 – Displays the sample locations where soil and sediment concentrations exceed Site PRGs for each of the four risk scenarios;

- Figure 4 – Displays the extent of contamination based on samples exceeding PRGs;
- Figure 5 – Displays the extent of onsite wetland areas requiring remediation based on the results of the BERA;
- Table 6 – Provides a summary of volumes that exceed radiological and chemical PRGs or have ecological risk; and
- Appendix C – Includes supporting data for the development of remedial volumes generated for the four human health risk scenarios (i.e., recreational user, adjacent resident with groundwater, adjacent resident without groundwater and onsite resident) and for the ecological exposure areas (i.e. onsite wetlands and Inner Rung).

3.0 DEVELOPMENT OF SOURCE MATERIAL REMEDIAL ALTERNATIVES

This section presents a summary of the development of remedial alternatives for the Shpack Superfund Site. Remedial alternatives developed for Shpack have considered both chemical and radiological risks associated with the Site and compliance with ARARs. Pursuant to legislation enacted by the 107th Congress, the USACE is authorized to clean up radiological contamination at Shpack (Appendix A). Three remedial alternatives have been evaluated to address source material contamination at the Shpack Superfund Site and are described below.

3.1 ALTERNATIVE SC-1: NO ACTION

In accordance with the NCP and RI/FS Guidance, the No Action Alternative is considered during the FS process as a baseline for comparison to other alternatives. This alternative represents the minimum proposed remedial action for source materials at the Site.

3.2 ALTERNATIVE SC-2: MULTI-BARRIER CAP/EXCAVATION/OFF-SITE DISPOSAL OF RADIOLOGICAL MATERIAL

This alternative does not include treatment, but it provides protection to human health by including the excavation, transport, and disposal offsite of soils exceeding radiological, PCB and dioxin PRGs and subsequent consolidation of impacted materials and installation of a landfill cap. The landfill cap would comply with RCRA Subtitle C requirements and would also be tied into the ALI landfill. All source materials would be consolidated to an upland location to the extent practical and capped in place with a clean soil cover, a gas collection layer, clay liner, impermeable geomembrane liner, drainage, protective and vegetation layers in accordance with RCRA Subtitle C requirements. Wetlands impacts would be minimized to the extent practicable. In addition, this alternative includes connecting two residences to public water.

In addition, an environmental monitoring plan would be developed to monitor groundwater quality at and adjacent to the site over a 30-year period. Five-year site reviews would be conducted to ensure the continued protection of human health and the environment.

This alternative considered four separate scenarios as possible future uses of the Site, including:

- SC-2A - Recreational user;
- SC-2B - Adjacent resident without groundwater consumption;
- SC-2C - Adjacent resident with groundwater consumption; and
- SC-2D - Onsite residential user.

3.3 ALTERNATIVE SC-3: EXCAVATION AND OFF-SITE DISPOSAL

This alternative includes excavation and off-site disposal of all impacted soils exceeding PRGs to prevent future exposure to impacted source materials at the Site. This alternative considered four separate scenarios to consider possible future uses of the Site, including:

- SC-3A - Recreational user;
- SC-3B - Adjacent resident without groundwater consumption;
- SC-3C - Adjacent resident with groundwater consumption; and
- SC-3D - Onsite residential user.

Alternative SC-3D, Onsite Residential User, does not distinguish between "with" and "without" groundwater consumption because:

- This alternative includes groundwater consumption; and
- Modeling for these scenarios demonstrate that cleanup to background is required and therefore soil volumes are the same.

Excavation activities include mobilizing all equipment and personnel to the Site, excavating soils exceeding PRGs and transportation and disposal of excavated materials to an approved off-site disposal facility. In addition, because wastes are commingled, all waste disposal costs are considered mixed waste (i.e., containing both chemical and radiological constituents). This alternative includes connecting two residences to public water.

4.0 DETAILED ANALYSIS OF ALTERNATIVES

This section presents the detailed analysis of remedial action alternatives that were retained from the screening performed in Section 2.0. The detailed analysis performed as part of this FS has been conducted in accordance with CERCLA Section 121, the NCP and USEPA RI/FS Guidance. Costs presented in this section are based on existing site data and will be reevaluated as part of the Remedial Design/Remedial Action (RD/RA) Phase. In accordance with USEPA RI/FS Guidance, costs presented in this section are intended to be within the target range of -30% to +50% of the actual cost of the remedial alternative as described.

4.1 DETAILED EVALUATION CRITERIA

This section presents a summary of the nine criteria used to evaluate the appropriate remedial alternative for the Site. The nine criteria are broken down into three categories and are summarized as follows:

- ***Threshold Criteria*** relate directly to statutory findings that must be made in the Record Of Decision. These criteria include:
    - Overall protection of human health and the environment; and
    - Compliance with ARARs.
- ***Balancing Criteria*** refer to five of the evaluation criteria that represent the primary criteria upon which the detailed evaluation is performed. These criteria include:
    - Long-term effectiveness and permanence;
    - Reduction of toxicity, mobility or volume;
    - Short-term effectiveness;
    - Implementability; and
    - Cost.
- ***Modifying criteria*** are evaluated following comment on the FS and the proposed plan. These criteria are not evaluated as part of the FS and include:
    - State acceptance; and
    - Community acceptance.

A description of the major components of each alternative, the costs for each alternative and comparison to the nine criteria is provided below.

4.2 ALTERNATIVE SC-1: NO ACTION

Under this alternative, no remedial technologies would be implemented at the Site to reduce soil or sediment concentrations in the source area. As a result, the only decreases in COPC concentrations would occur from naturally occurring degradation processes.

A comparison of this alternative to the criteria established in the NCP is included as Table 7. As shown in Table 8, there are no costs associated with the No Action alternative.

This alternative does not meet ARAR requirements for radiological and chemical source material.

4.3 ALTERNATIVE SC-2: MULTI-BARRIER CAP/EXCAVATION/OFF-SITE DISPOSAL OF RADIOLOGICAL MATERIAL

This alternative includes installing a multi-barrier landfill cap to limit water infiltration and subsequent migration of contaminants, and excavation and off-site disposal of radiological, PCB and dioxin material exceeding PRGs. This alternative eliminates the exposure pathways of soil and sediment dermal contact and ingestion. The capping portion of this alternative is included as part of the FS to comply with the Federal RCRA ARAR requirements for implementation of an appropriately designed landfill cap at Superfund sites. The landfill will be designed and installed in accordance with:

- 40 CFR 264 Subpart G (closure and post-closure);
- 40 CFR 264 Subpart N (landfills).

The primary components of this alternative include:

- Coordination with local, state and federal agencies for landfill construction with an engineered cap;
- Coordination with National Grid for landfill cap construction to ensure the structural integrity of the overhead power lines;
- Connecting two residences to public water;

- Mobilization and demobilization of required personnel and equipment to the site for consolidation and cap construction. Mobilization and demobilization activities are assumed to require two months;
- Limited excavation of and off-site disposal at an approved facility of 2,900 cubic yards (yd^3) of dioxin and PCB source material exceeding Land Disposal Regulations (LDRs) and the Toxic Substances Control Act (TSCA) regulations;
- Excavation / off-site disposal of radiological soil exceeding PRGs. This soil volume varies, depending on the future use of the Site as follows:
    - SC-2A - Recreational user – 8,452 yd^3 (over a period of five months)
    - SC-2B - Adjacent Resident without GW consumption – 10,046 yd^3 (over a period of five months)
    - SC-2C - Adjacent Resident with GW consumption – 60,437 yd^3 (over a period of 16 months)
    - SC-2D - Onsite Resident – 64,025 yd^3 (over a period of 16 months)
- Consolidation of 1,111 yd^3 soil / sediment from the Inner Rung and over a period of one month;
- Consolidation of materials contained in the Tongue Area within the main site area prior to capping;
- Clearing and grubbing of the entire site to prepare for consolidation and cap construction;
- Consolidation of surface debris into the landfill, which will cover only the western portion of the main Site to allow for wetlands restoration / replication in the eastern portion of the Site;
- Consolidation of soil and sediment exceeding chemical or ecological PRGs onto upland cap portion;
- Grading cover materials to slope towards perimeter drainage trenches directing surface flow towards a stormwater retention pond located near the existing Tongue Area. This stormwater drainage system will be designed to reduce site run-on from off-site, upgradient areas and includes up to 2,700 feet of drainage swales surrounding the cap;
- Placement of fill to enhance stabilization in the cap area;

- Placement of 12-inch gas collection layer and installation of passive gas vents and risers;
- Placement of geosynthetic clay liner;
- Placement of a 40 millimeter thick very low density polyethylene (VLDPE) flexible membrane liner;
- Placement of a 12-inch thick drainage layer;
- Placement of approximately 2,000 linear feet of 4-inch diameter cover drainage tubing;
- Placement of protective soil, topsoil, erosion control mats and hydroseeding over the entire landfill cover;
- Installation of a chainlink fence surrounding the entire capped area, with access gates;
- Restoration / replication of up to 3.2 acres of wetlands on the eastern portion of the Site;
- Initiation of 30-year groundwater monitoring program, including installation of additional wells around the perimeter of the landfill;
- Performance of 5-year reviews to monitor effectiveness of the cap; and
- Implementation of deed restrictions to restrict future use of the property.

Figure 4 displays the estimated excavation areas exceeding PRGs for each of the risk scenarios, and Figure 5 shows areas with ecological risk. Table 6 displays a summary of the volumes of impacted material for each risk scenario. Under each risk scenario, the amount of soil to be excavated varies; however, the general excavation and disposal method is consistent.

Upon completion of the landfill cap, it is estimated that capping materials will raise the ground surface by up to eight feet. It is anticipated that this new elevation will not meet National Grid clearance requirements for the existing power transmission lines transecting the site. Therefore, coordination with National Grid will be required during the RD / RA phase to develop a plan for cap construction activities that will ensure worker health and safety (e.g., use of low profile equipment) and comply with transmission line clearance requirements. Specifically, if sufficient clearance exists, the cap will need to be tied into the existing support towers or, if sufficient clearance will not exist following remedial activities, the support towers will need to be raised. A line item cost

estimate has been included to account for coordination with National Grid and to implement tower changes.

Under this alternative, limited excavation and off-site disposal of soil containing dioxins and PCBs must be removed from the site. Approximately 2,900 cubic yards of soil containing dioxins and PCBs will be excavated and disposed of offsite at an approved, licensed disposal facility prior to installation of the landfill cap.

A comparison of Alternative SC-2 to seven of the nine NCP criteria is provided on Table 9. A detailed cost estimate for Alternatives SC-2A through SC-2D is provided on Tables 10A through Table 10D. The total estimated cost for various scenarios under this alternative are estimated to be as follows:

- SC-2A - Recreational user – $26,057,000
- SC-2B - Adjacent Resident without GW consumption – $28,106,000
- SC-2C - Adjacent Resident with GW consumption – $94,514,000
- SC-2D - Onsite Resident – $98,066,000

All costs include 30 years of operation, maintenance and monitoring.

4.4 ALTERNATIVE SC-3: EXCAVATION AND OFFSITE DISPOSAL

Under this alternative, all source area materials exceeding PRGs will be excavated and transported for offsite disposal. As a result, this alternative would provide permanent elimination of COPCs exceeding PRGs at the Site.

The primary components of this alternative include:

- Coordination with local, state and federal agencies for excavating source area materials within a wetland and associated buffer zone;
- Preparation of a traffic control plan to adequately manage the increased volume of truck traffic associated with transportation of chemical and radiological impacted source material from the site;
- Coordination with National Grid for consolidation near existing power lines;
- Connecting two residences to public water;

- Mobilization of all personnel and equipment to the site for consolidation activities;
- Clearing and grubbing areas of the site requiring excavation;
- Establishing a survey grid to conduct sequential consolidation of gridcells to minimize generation of large quantities of groundwater with one open excavation;
- Based on the potential risk scenarios for the site, excavation of the following volumes of soil and sediment exceeding radiological and chemical PRGs or exceeding LDRs and TSCA regulations:
    - SC-3A - Recreational user – 32,850 yd^3
    - SC-3B - Adjacent Resident without GW consumption – 34,445 yd^3
    - SC-3C - Adjacent Resident with GW consumption – 84,835 yd^3
    - SC-3D - Onsite Resident – 89,858 yd^3
- Excavation and off-site disposal of 1,111 yd^3 soil / sediment from the Inner Rung and over a period of one month.
- Consolidation of soil and sediment exceeding chemical or ecological PRGs onto upland cap portion;
- Dewatering of open areas as needed in each area of the Site;
- Transportation of all impacted soils via truck and rail to an approved offsite disposal facility; and
- Placement of clean fill in open areas to backfill to grade and / or wetlands restoration / replication as appropriate.

Figure 4 displays the estimated excavation areas exceeding PRGs for each of the risk scenarios, and Figure 5 shows areas with ecological risk. Table 6 displays a summary of the volumes of impacted material for each risk scenario. Under each risk scenario, the amount of soil to be excavated varies; however, the general excavation and disposal method is consistent.

A comparison of Alternatives SC-3A through SC-3D to seven of the nine NCP criteria is provided on Table 11. A detailed estimate of costs associated with each of the risk scenarios associated with this alternative is provided as Tables 12A through Table 12B.

The total estimated costs for each of the risk scenarios associated with this alternative are as follows:

- SC-3A - Recreational user – $54,055,000
- SC-3B - Adjacent Resident without GW consumption – $55,553,000
- SC-3C - Adjacent Resident with GW consumption – $120,888,000
- SC-3D - Onsite Resident – $126,868,000

There are no long-term operation and maintenance activities associated with this alternative.

5.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

This purpose of this section is to evaluate the relative performance of each alternative described above with respect to seven of the nine NCP evaluation criteria. This section is used to aid in the selection of a remedial alternative for the Shpack Superfund Site by evaluating the advantages and disadvantages of each alternative as compared to these NCP criteria.

5.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Alternative SC-1, No Action, would be the least protective of human health and the environment because it would offer no protection to human health and the environment. Because no remedial action would be performed, both chemical and radiological impacts exceeding site-specific PRGs and ARARs would remain at the Site. Therefore, potential future unacceptable exposure to human health and the environment would remain at the Site. In addition, current risk remains from manganese in drinking water. As a result, this alternative would not meet the threshold criteria in the NCP.

Alternatives SC-2 and SC-3 both provide overall protection of human health and the environment. Each of these alternatives would eliminate exposure to impacted source materials exceeding site-specific PRGs. In addition, Alternative SC-2 would remove all radiological waste exceeding cleanup requirements from the Site. Under Alternative SC-2, chemical COPCs exceeding PRGs would be consolidated beneath a RCRA landfill cap and will prevent exposure to those materials that present an unacceptable risk. This alternative also includes requirements for monitoring to ensure that potential future exposure does not occur. Alternative SC-3, Excavation and Off-Site Disposal, would eliminate exposure to impacted radiological and chemical source materials by removing them from the Site. Because this alternative removes all materials that pose an unacceptable risk, it provides the greatest degree of overall protection. Alternatives SC-2 and SC-3 also include connecting two residences to public water to eliminate exposure to impacted groundwater.

5.2 COMPLIANCE WITH ARARS

Alternative SC-1, No Action, would not comply chemical-specific ARARs applicable to the Site.

Alternatives SC-2 and SC-3 would meet all chemical, location, and action-specific ARARs, with the exception that those alternatives that include groundwater consumption will not meet chemical specific groundwater / drinking water requirements. Tables 1A through 1I include additional identification and discussion of ARARs for each alternative.

5.2.1 Wetlands Analysis/Endangered Species

Federal and State location-specific ARARs address wetland management, as well as protection of fish and wildlife. The goal of these regulations is to protect resource areas. They set performance standards for the level of protection needed to ensure the resource areas are unharmed or that any harm is minimized during the design and implementation of projects built in these areas. A general description of the significant location-specific ARARs and how the alternatives discussed in this Feasibility Study will meet the requirements is set out below.

The federal Wetlands Executive Order and Section 404 of the Clean Water Act require determinations that no practical alternative exists to conducting activities in wetlands. Significant soil, sediment, and groundwater contamination is present in wetland areas at the Site, primarily in the interior wetlands and the inner-rung Tongue Area sediments, and each of these areas presents unacceptable either human health or ecological risks. Because of this, each of these wetland areas must be disturbed (excavated or consolidated) in order for cleanup work to be conducted.

Given that there is no practical alternative to conducting work in the wetlands, minimal impact to these wetlands areas is required to the extent practical. For both Alternatives SC-2 and SC-3, best management practices will be used throughout the Site to minimize adverse impacts on the wetlands, wildlife and its habitat. Damage to these wetlands will be mitigated though erosion control measures and proper regrading and re-vegetation of the impacted area with indigenous species. Following excavation activities, wetlands will be restored or replicated consistent with the requirements of the Federal and State wetlands protection laws.

For those Alternatives (SC-2A to -2D) that require capping, actions will be taken to minimize, to the extent practical, the area of wetlands that will be

permanently covered with a cap. Because waste extends up to 15 feet below the water table in wetlands areas in portions of the site, dewatering and waste excavation below the water table may not be practicable in some instances. In those cases, a cap will need to be placed over that portion of the wetlands. The degree of impact to the wetlands varies significantly depending upon the risk scenarios presented in Alternatives 2A-2D (see Figures 4 and 5 for potential minimum and maximum impacts). For the recreational user and adjacent resident without groundwater consumption scenarios, soil/sediment in wetlands areas exceeding cleanup levels are fairly close to the surface. Therefore, these materials can be excavated and consolidated on to upland areas with very minimal encroachment, if at all, into wetlands from the cap. For the on-site resident and adjacent resident with groundwater consumption scenarios, soil/sediment in wetlands areas exceeding cleanup levels may be located significantly further down beneath the water table. It may not be practical in all cases to dewater the wetlands area to a sufficient depth to excavate all waste that exceeds cleanup levels under these scenarios. As a result, some portion of the wetlands may need to be covered with a cap. The approximate acreage of wetlands placed under the cap will be replicated with an equivalent area adjacent to the cap. In those cases where waste will be capped in place in wetlands areas, capping will be limited to the extent practical to only those areas where dewatering and excavation is clearly not practical due to the depth of contamination exceeding cleanup levels beneath the water table.

Finally, both Alternatives SC-2 and SC-3 will address the issues raised by the identification of a vernal pool on the Site consistent with the Massachusetts Wetland Protection Act (310 CMR 10.00). In addition, both alternatives will address the issues raised by the identification of the spotted turtle on the Site consistent with the Massachusetts Endangered Species Act (321 CMR 10.00).

5.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

Alternative SC-1, No Action, does not provide any long-term effectiveness or permanence.

Alternative SC-2 would provide both long-term effectiveness and permanence because landfill capping is a proven technology to eliminate exposure to chemical waste material effectively in the long-term. The cap would be regularly maintained to ensure that it remains effective in the long-term. In addition, because the radiological waste is excavated and disposed of off-site, it is permanent and effective in the long-term.

Alternative SC-3 provides long-term effectiveness and permanence as well because both chemical and radiological source materials exceeding cleanup levels would be permanently removed from the site thereby ensuring that this remedy remains effective in the long-term.

In addition, Alternatives SC-2 and SC-3 include connecting two residences to public water. These Alternatives provide additional long-term effectiveness and permanence because they eliminate potential risk from drinking water.

5.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

None of the alternatives reduce toxicity, mobility, or volume through treatment (although some materials shipped off-site may require treatment prior to final disposal).

However, Alternative SC-2 would reduce toxicity, mobility or volume, although not through treatment. This alternative would reduce mobility of the chemical contaminants that are placed beneath the landfill cap at the Site by preventing water from coming into contact to with waste material thereby preventing this contamination from mobilizing. The toxicity of the radiological waste material would be greatly reduced / eliminated because all of this material that exceeds cleanup levels will be removed from the site. In addition, because all soil and sediment above cleanup levels established for radiological waste material will be removed from the property, both the volume and mobility of this contamination is greatly reduced / eliminated, although not through treatment.

Alternative SC-3 would reduce toxicity by removing both the radiological and chemical waste material from the Site, thereby greatly reducing / eliminating the toxicity of what remains at the Site to acceptable levels. In addition, because all soil and sediment above cleanup levels will be removed from the property, both the volume and mobility of contamination is greatly reduced / eliminated, although not through treatment.

5.5 SHORT-TERM EFFECTIVENESS

Because Alternative SC-1, No Action, would not require any activities to be conducted, there would not be any short-term impacts on the community and on-site workers.

Alternative SC-2 would have some short-term impacts to the community from both the construction activities as well as from shipping materials off-site for disposal. However, these impacts can be greatly reduced by using standard construction techniques at the Site during consolidation and construction of the cap. In addition, air monitoring will be conducted to ensure that adjacent residents are not adversely impacted while this Alternative is being implemented. Appropriate OSHA/health and safety requirements will be followed to reduce risk to on-site workers. Because this Alternative requires off-site disposal of radiological waste, there will be an increase in truck traffic through the community during the 1-2 year time frame it will take to implement this remedy.

Alternative SC-3 would have the greatest short-term effects because this Alternative would require all chemical and radiological waste material to be excavated and shipped off-site for disposal. However, these impacts can be greatly reduced by using standard construction techniques at the Site during the consolidation and shipping phase. In addition, air monitoring will be conducted to ensure that adjacent residents are not adversely impacted while this Alternative is being implemented. Appropriate OSHA/health and safety requirements will be followed to reduce risk to on-site workers. Because this Alternative requires off-site disposal of both chemical and radiological waste, there will be a significant increase in truck traffic through the community during the 2-year time frame it will take to implement this remedy.

5.6 IMPLEMENTABILITY

Alternative SC-1 is the easiest to implement because no remedial actions are required.

Alternatives SC-2 and SC-3 are both easily implementable because they both involve reliable waste disposal technologies with proven histories of success. In addition, the personnel, equipment and materials required to implement each of these technologies are readily available. The greatest degree of variability in these alternatives is derived from the timeframe required for implementation of these alternatives and the impact on the community.

5.7 COST

Alternative SC-1, No Action, would require the least cost, as there are no costs associated with this Alternative.

Alternative SC-2 is generally the second most expensive alternative, with cost estimates ranging from $26,057,000 to $99,066,000 based upon the risk exposure scenario.

- Alternative SC-2A - Recreational user – $26,057,000
- Alternative SC-2B - Adjacent Resident without GW consumption – $28,106,000
- Alternative SC-2C - Adjacent Resident with GW consumption – $94,514,000
- Alternative SC-2D - Onsite Resident – $99,066,000

Alternative SC-3 is generally the most expensive alternative, with estimated costs ranging from $54,055,000 to $126,868,000 based on the risk exposure scenario.

- SC-3A - Recreational user – $54,055,000
- SC-3B - Adjacent Resident without GW consumption – $55,553,000
- SC-3C - Adjacent Resident with GW consumption – $120,888,000
- SC-3D - Onsite Resident – $126,868,000

Tables

Table 1A
Alternative SC-1 - No Action
Potential Chemical-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Soil/ Groundwater	Massachusetts Regulations for Control of Radiation (105 CMR 120)	Relevant and Appropriate	Establishes standards for radiation related activities.	*
Groundwater	Massachusetts Department of Environmental Protection (DEP) Drinking Water Standards 310 CMR 22.00 (March, 1997) and Addendum (June, 1999)	Relevant and Appropriate	Maximum Contaminant Limits regulate the concentration of contaminants in public drinking water supplies.	*
	Massachusetts Groundwater Quality Standards (314 CMR 6.00)	Relevant and Appropriate	These standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected, and set forth water quality criteria necessary to maintain the designated areas. GW-3 and GW-1 groundwater standards apply to the site.	*
FEDERAL REGULATORY REQUIREMENTS				
Non-Environmental Materials	Department of the Army, USACE EM-385-1-80, Table 6-4	To be Considered	This USACE Radiation Protection Manual table sets acceptable surface contamination levels for U-nat, U-235, U-238 and associated decay products for release of equipment and non-environmental materials (e.g., old kitchen appliances).	*
Soil	Domestic Licensing of Source Material (10 CFR 40, Appendix A, I Criterion 6(6))	Relevant and Appropriate	Establishes benchmark approach for setting clean-up levels for radionuclides.	*
	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR Part 192)	Relevant and Appropriate	Establishes concentration limits for clean-up of Ra-226, Ra-228 and thorium in soil.	*
	Use of Soil Clean-up Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites, Directive No. 9200.4-25, February 12, 1998.	To be Considered	Addresses use of soil clean-up criteria in 40 CFR 192 in setting remediation levels for subsurface soil at CERCLA sites with radioactive contamination.	*
	Remediation Goals for Radioactively-Contaminated CERCLA Site Using the Benchmark Dose Clean-Up Criteria in 10 CFR 40, Appendix A, I, Criterion 6(6), Directive No. 9200-4-35P, April 11, 2000.	To be Considered	Addresses the use of the soil and structure clean-up criteria in 10 CFR 40, Appendix A, I, Criterion 6(6) with setting remediation goals at CERCLA sites with radioactive contamination.	*
	Licensing Requirements for Land Disposal of Radioactive Waste (10 CFR 61.41)	Relevant and Appropriate	Provides objectives for the land disposal of low-level radioactive waste (LLW). Potential ARAR where LLW left onsite.	*
Groundwater	Federal Safe Drinking Water Act - Maximum Contaminated Levels (MCLs) for Organic and Inorganic Chemicals (40 CFR 141 Subparts B, G and I)	Relevant and Appropriate	Promulgates MCLs for a number of common organic and inorganic chemicals and action levels for lead and copper. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered appropriate for groundwater aquifers potentially used for drinking water.	*
	Federal Safe Drinking Water Act - non-zero Maximum Contaminant Level Goals (MCLGs) for Organic and Inorganic Chemicals (40 CFR 141 Subpart F)	Relevant and Appropriate	Establishes MCLGs for organic and inorganic contaminants. MCLGs that are non-zero will be relevant and appropriate.	*
	USEPA Reference Doses (RfDs) and EPA Carcinogen Assessment Group Potency Factors	To Be Considered	RfD is an estimate of a daily oral exposure to human population that is likely to be without an appreciable risk of noncancer effects. The Cancer Group Potency Factors are used as a qualitative weight-of-evidence judgement to the likelihood of a chemical being a carcinogen.	*
	USEPA Health Advisories	To Be Considered	Health Advisory is an estimate of acceptable drinking water levels for a chemical based on health effects.	*

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Because this alternative does not require any action to be taken, this ARAR is not met.

Table 1B
Alternative SC-2A - Multi-Barrier Cap/Consolidation of Radiological Material (Recreational User)
Potential Chemical-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Soil / Groundwater	Massachusetts Regulations for Control of Radiation (105 CMR 120)	Relevant and Appropriate	Establishes standards for radiation related activities.	*
Groundwater	Massachusetts Department of Environmental Protection (DEP) Drinking Water Standards 310 CMR 22.00 (March, 1997) and Addendum (June, 1999)	Relevant and Appropriate if groundwater remains designated as drinking water / potential drinking water source	Maximum Contaminant Limits regulate the concentration of contaminants in public drinking water supplies.	**
	Massachusetts Groundwater Quality Standards (314 CMR 6.00)	Relevant and Appropriate if groundwater remains designated as drinking water / potential drinking water source	These standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected, and set forth water quality criteria necessary to maintain the designated areas. GW-3 and GW-1 groundwater standards apply to the site.	**
FEDERAL REGULATORY REQUIREMENTS				
Non-Environmental Materials	Department of the Army, USACE EM-385-1-80, Table 6-4	To be Considered	This USACE Radiation Protection Manual table sets acceptable surface contamination levels for U-nat, U-235, U-238 and associated decay products for release of equipment and non-environmental materials (e.g., old kitchen appliances).	*
Soil	Domestic Licensing of Source Material (10 CFR 40, Appendix A, I Criterion 6(6))	Relevant and Appropriate	Establishes benchmark approach for setting clean-up levels for radionuclides.	*
	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR Part 192)	Relevant and Appropriate	Establishes concentration limits for clean-up of Ra-226, Ra-228 and thorium in soil.	*
	Use of Soil Clean-up Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites, Directive No. 9200.4-25, February 12, 1998.	To be Considered	Addresses use of soil clean-up criteria in 40 CFR 192 in setting remediation levels for subsurface soil at CERCLA sites with radioactive contamination.	*
	Remediation Goals for Radioactively-Contaminated CERCLA Site Using the Benchmark Dose Clean-Up Criteria in 10 CFR 40, Appendix A, I, Criterion 6(6), Directive No. 9200-4-35P, April 11, 2000.	To be Considered	Addresses the use of the soil and structure clean-up criteria in 10 CFR 40, Appendix A, I, Criterion 6(6) with setting remediation goals at CERCLA sites with radioactive contamination.	*
	Federal Safe Drinking Water Act - Maximum Contaminated Levels (MCLs) for Organic and Inorganic Chemicals (40 CFR 141 Subparts B, G and I)	Relevant and Appropriate if groundwater remains designated as drinking water / potential drinking water source	Promulgates MCLs for a number of common organic and inorganic chemicals and action levels for lead and copper. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered appropriate for groundwater aquifers potentially used for drinking water.	**
Groundwater	Federal Safe Drinking Water Act - non-zero Maximum Contaminant Level Goals (MCLGs) for Organic and Inorganic Chemicals (40 CFR 141 Subpart F)	Relevant and Appropriate if groundwater remains designated as drinking water / potential drinking water source	Establishes MCLGs for organic and inorganic contaminants. MCLGs that are non-zero will be relevant and appropriate.	**
	USEPA Reference Doses (RfDs) and EPA Carcinogen Assessment Group Potency Factors	To Be Considered	RfD is an estimate of a daily oral exposure to human population that is likely to be without an appreciable risk of noncancer effects. The Cancer Group Potency Factors are used as a qualitative weight-of-evidence judgement to the likelihood of a chemical being a carcinogen.	**
	USEPA Health Advisories	To Be Considered	Health Advisory is an estimate of acceptable drinking water levels for a chemical based on health effects.	**
Sediment	Ontario Ministry of the Environment Sediment Quality Guidelines	To Be Considered	The Sediment Quality Guidelines present scientific data and guidance on the environmental effects of pollutants. The criteria can contribute to establishing requirements that govern impacts to sediment quality.	***

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Will be met through excavation and off-site disposal of radiological material.

** Will not be met due to presence of off-site source.

*** Will be met through excavation and off-site disposal of radiological material and capping of chemical contamination.

Table 1B
Alternative SC-2A - Multi-Barrier Cap/Consolidation of Radiological Material (Recreational User)
Location-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Wetland Sediment	Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00)	Applicable	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling altering or polluting inland wetlands. This requirement regulates work within the wetlands buffer zone, and defines wetlands based on vegetation type and mitigation requirements.	***
	401 Water Quality Certification for Discharge of Dredged or Fill Material (314 CMR 9.00)	Applicable	ARAR if discharge of dredged or fill material occurs.	***
	Massachusetts Endangered Species Act (321 CMR 10.00)	Applicable	Requires that site activities be conducted in a manner that minimizes impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	**
FEDERAL REGULATORY REQUIREMENTS				
Wetland Sediment	Federal Executive Order on Protection of Wetlands (E.O. 11990, 40 CFR Part 6, Appendix A)	Applicable	Requires federal agencies to avoid impacts associated with the destruction or loss of wetlands, minimize potential harm, preserve and enhance wetlands, and avoid support of new construction in wetlands if a practicable alternative exists.	*
	Federal Fish and Wildlife Coordination Act (16 USC 661 et. seq., 40 CFR Part 6)	Applicable	Establishes requirements for a consultation with U.S. Fish and Wildlife Service and state wildlife agencies to mitigate losses of fish and wildlife that result from modification of a water body.	****
	Federal Clean Water Act (33 USC 1344), US Army Corps of Engineers Nationwide Permit Program (33 CFR Part 330), "Federal Guidelines for Specification of Disposal Sites" (40 CFR Part 230), Clean Water Act Sections 401 and 404 (33 CFR 26)	Applicable	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative that has less effect is available. The requirements also describe actions to minimize adverse impacts. Establishes regulations for filling and dredging within wetlands.	*
	Endangered Species Act (50 CFR Parts 17.11-12)	Applicable	Requires site action be conducted in a manner that avoids harming threatened or endangered species or their habitat.	**

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Because high levels of contamination exist in wetlands area, there is no practical alternative to excavating wetlands areas. Actions will be taken to minimize impacts to the maximum extent practical.

** Should threatened, protected or endangered species be encountered, the requirements of these regulations will be met.

*** Because excavation is required in the wetlands / buffer zone, all substantive requirements of these regulations will be met.

**** Should this alternative require modification of a water body, this consultation requirement will be conducted.

Table 1B
Alternative SC-2A - Multi-Barrier Cap/Consolidation of Radiological Material (Recreational User)
Potential Action-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Air	Massachusetts DEP Air Pollution Control Regulations (310 CMR 7.00)	Applicable	These regulations set requirements for fugitive emissions, dust, and particulates.	*
Soil	Massachusetts DEP Solid Waste Regulations (310 CMR 19.00)	Relevant and Appropriate	This regulation may be relevant and appropriate for landfill gas issues.	**
	Massachusetts DEP Hazardous Waste Regulations (310 CMR 30.000)	Relevant and Appropriate	These regulations describe the requirements for treatment, storage, and disposal of hazardous waste.	**
FEDERAL REGULATORY REQUIREMENTS				
Air	Federal RCRA Air Emission Standards for Equipment Leaks (40 CFR Part 264, Subpart BB)	Relevant and Appropriate, if treatment involves groundwater with organic concentration of at least 10% by weight.	Standards for air emissions for equipment that contains or contacts RCRA wastes with organic concentrations of at least 10% by weight.	***
	Federal RCRA Air Emission Standards for Process Vents (40 CFR Part 264, Subpart AA)	Relevant and Appropriate, if threshold concentrations are met	Standards for air emissions from process vents associated with distillation, fractionation, thin film evaporation, column extraction or air steam stripping operations that treat RCRA substances and have total organic concentrations of 10 ppm or greater.	***
	Federal Clean Air Act - Non-Methane Organic Compounds (40 CFR Part 60, Subpart WWW)	Relevant and Appropriate, if threshold concentrations are met	Regulations require NMOC-specific gas collection and control systems, monitoring, and gas generation estimates. The rule establishes a performance standard for NMOCs emissions of greater than 50 megagrams / year from municipal solid waste landfills.	***
	National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Clean Air Act (40 CFR 61, Subparts H and I)	Relevant and Appropriate	Regulates air emissions of VOCs and radionuclides.	*

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* These requirements will be met during all construction activities.

** The requirements that address landfills will be met in the construction of and operation of the landfill cap.

*** If these are determined to be relevant and appropriate, then substantive requirements will be met in addressing emission from landfill.

Table 1B
Alternative SC-2A - Multi-Barrier Cap/Excavation (Recreational User)
Potential Action-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
FEDERAL REGULATORY REQUIREMENTS				
Soil	Toxic Substances Control Act (TSCA) (15 USC 2601)	Applicable	Soil containing > 50 ppm PCBs are regulated under this Act.	**
	Federal RCRA Subtitle C (40 CFR Part 264 Subpart N - Landfills, Section 264.310)	Relevant and Appropriate	Requirements for Hazardous Waste landfill closure.	*
	Federal RCRA Subtitle C (40 CFR Part 264 Subpart G - Closure and Post Closure, Sections 264.111, 264.114, and 264.117)	Relevant and Appropriate	Establishes performance standards for closure of hazardous waste landfills and groundwater monitoring.	*
	Federal RCRA Subtitle C (40 CFR Part 264 Subpart B - General Facility Standards, Section 264.19)	Relevant and Appropriate	Requirements for developing a Construction Quality Assurance Program for final cover system.	*
	Technical Memorandum: Revised Landfill Cap Design Guidance Proposed for Unlined, Hazardous Waste Landfills in EPA Region I (5 Feb 2001)	To Be Considered	Provides guidance for landfill cap design for unlined, hazardous waste landfills at Superfund landfill sites in EPA Region I.	*
	USEPA Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments (EPA / 530-SW-89-047)	To Be Considered	Presents technical specifications for the design of multi-barrier covers at landfills at which hazardous wastes were disposed.	*
Groundwater	Federal Ambient Water Quality Criteria (AWQC) (CWA 303)	Relevant and Appropriate	Federal AWQC are health-based criteria which have been developed for certain carcinogenic and noncarcinogenic compounds.	***
	Federal RCRA Subtitle C Regulations (40 CFR Part 264 Subpart F - Releases from Solid Waste Management Units, Sections 264.95, 264.96(a) and (c), 264.97, 264.98 and 264.99)	Relevant and Appropriate	Groundwater monitoring requirements and compliance points for determining the need for additional monitoring and corrective action.	****

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* The requirements will be met in the design, construction and operation of the land fill cap.

** Should PCBs be encountered during excavation / consolidation, they will be addressed consisting with these requirements.

*** These criteria will be used to determine whether this alternative minimizes the impacts of the site to surface water.

**** Groundwater monitoring will be conducted to determine the effectiveness of the remedy.

Table 1B
Alternative SC-2A - Multi-Barrier Cap/Consolidation of Radiological Material (Recreational User)
Potential Radiological-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements
STATE REGULATORY REQUIREMENTS			
Soil / Groundwater	Massachusetts Regulations for Control of Radiation (105 CMR 120)	Relevant and Appropriate	Establishes standards for radiation related activities.
FEDERAL REGULATORY REQUIREMENTS			
Air	National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Clean Air Act (40 CFR 61, Subparts H and I)	Relevant and Appropriate	Provides guidance on air emissions of radionuclides during cleanup of Federal Facilities and licensed NRC facilities with radioactive contamination.
Groundwater	Ore Mining and Dressing Point Source Category (40 CFR 440, Subpart C)	Relevant and Appropriate	Regulates effluent limits from facilities that extract / process uranium, radium and vanadium ores. May be applicable to discharges of radioactive waste to surface waters.
	Federal Water Quality Criteria (FWQC) and State Water Quality Standards (Water Quality Criteria, Report of the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1986)	To be considered	FWQC are criteria / standards for the protection of aquatic life and / or human health.
	Health and Environmental Protection for Uranium and Thorium Tailings (40 CFR 192, Subpart A, Table 1)	Relevant and Appropriate	Standards have been developed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for sites that are exempt from CERCLA for radium / thorium in soil.
	Federal Safe Drinking Water Act - Maximum Contaminant Levels (MCLs) for Radiological Constituents (40 CFR 141 Subparts B, G and I)	Applicable, if non-zero	MCLs have been promulgated for a number of radiological constituents. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered appropriate for groundwater aquifers potentially used for drinking water.
Soil	Health and Environmental Protection for Uranium and Thorium Tailings (40 CFR 192.12, 192.32, 192.41)	Relevant and Appropriate	Standards have been developed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for sites that are exempt from CERCLA for radium / thorium in soil.
	Licensing Requirements for Land Disposal of Radioactive Waste (10 CFR 61.41)	Relevant and Appropriate	Provides performance objectives for licensed disposal sites containing low level radioactive waste if the waste will be left permanently on site.

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

See chemical-, action-, and location-specific ARAR tables for a discussion of how the radiological-specific ARARs are addressed, if at all, by this alternative.

Table 1C
Alternative SC-2B - Multi-Barrier Cap/Consolidation of Radiological Material (Adjacent Resident Without Groundwater Consumption)
Potential Chemical-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Soil / Groundwater	Massachusetts Regulations for Control of Radiation (105 CMR 120)	Relevant and Appropriate	Establishes standards for radiation related activities.	*
FEDERAL REGULATORY REQUIREMENTS				
Non-Environmental Materials	Department of the Army, USACE EM-385-1-80, Table 6-4	To be Considered	This USACE Radiation Protection Manual table sets acceptable surface contamination levels for U-nat, U-235, U-238 and associated decay products for release of equipment and non-environmental materials (e.g., old kitchen appliances).	*
Soil	Domestic Licensing of Source Material (10 CFR 40, Appendix A, I Criterion 6(6))	Relevant and Appropriate	Establishes benchmark approach for setting clean-up levels for radionuclides.	*
	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR Part 192)	Relevant and Appropriate	Establishes concentration limits for clean-up of Ra-226, Ra-228 and thorium in soil.	*
	Use of Soil Clean-up Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites, Directive No. 9200.4-25, February 12, 1998.	To be Considered	Addresses use of soil clean-up criteria in 40 CFR 192 in setting remediation levels for subsurface soil at CERCLA sites with radioactive contamination.	*
	Remediation Goals for Radioactively-Contaminated CERCLA Site Using the Benchmark Dose Clean-Up Criteria in 10 CFR 40, Appendix A, I, Criterion 6(6), Directive No. 9200-4-35P, April 11, 2000.	To be Considered	Addresses the use of the soil and structure clean-up criteria in 10 CFR 40, Appendix A, I, Criterion 6(6) with setting remediation goals at CERCLA sites with radioactive contamination.	*
Sediment	Ontario Ministry of the Environment Sediment Quality Guidelines	To Be Considered	The Sediment Quality Guidelines present scientific data and guidance on the environmental effects of pollutants. The criteria can contribute to establishing requirements that govern impacts to sediment quality.	***

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Will be met through excavation and off-site disposal of radiological material.

*** Will be met through excavation and off-site disposal of radiological material and capping of chemical contaminants.

Table 1C
Alternative SC-2B - Multi-Barrier Cap/Consolidation of Radiological Material (Adjacent Resident Without Groundwater Consumption)
Potential Location-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Wetland Sediment	Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00)	Applicable	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling altering or polluting inland wetlands. This requirement regulates work within the wetlands buffer zone, and defines wetlands based on vegetation type and mitigation requirements.	***
	401 Water Quality Certification for Discharge of Dredged or Fill Material (314 CMR 9.00)	Applicable	ARAR if discharge of dredged or fill material occurs.	***
	Massachusetts Endangered Species Act (321 CMR 10.00)	Applicable	Requires that site activities be conducted in a manner that minimizes impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	**
FEDERAL REGULATORY REQUIREMENTS				
Wetland Sediment	Federal Executive Order on Protection of Wetlands (E.O. 11990, 40 CFR Part 6, Appendix A)	Applicable	Requires federal agencies to avoid impacts associated with the destruction or loss of wetlands, minimize potential harm, preserve and enhance wetlands, and avoid support of new construction in wetlands if a practicable alternative exists.	*
	Federal Fish and Wildlife Coordination Act (16 USC 661 et. seq., 40 CFR Part 6)	Applicable	Establishes requirements for a consultation with U.S. Fish and Wildlife Service and state wildlife agencies to mitigate losses of fish and wildlife that result from modification of a water body.	****
	Federal Clean Water Act (33 USC 1344), US Army Corps of Engineers Nationwide Permit Program (33 CFR Part 330), "Federal Guidelines for Specification of Disposal Sites" (40 CFR Part 230), Clean Water Act Sections 401 and 404 (33 CFR 26)	Applicable	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative that has less effect is available. The requirements also describe actions to minimize adverse impacts. Establishes regulations for filling and dredging within wetlands.	*
	Endangered Species Act (50 CFR Parts 17.11-12)	Applicable	Requires site action be conducted in a manner that avoids harming threatened or endangered species or their habitat.	**

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Because high levels of contamination exist in wetlands area, there is no practical alternative to excavating wetlands areas. Actions will be taken to minimize impacts to the maximum extent practical.

** Should threatened, protected or endangered species be encountered, the requirements of these regulations will be met.

*** Because excavation is required in the wetlands / buffer zone, all substantive requirements of these regulations will be met.

**** Should this alternative require modification of a water body, this consultation requirement will be conducted.

Table 1C
Alternative SC-2B - Multi-Barrier Cap/Consolidation of Radiological Material (Adjacent Resident Without Groundwater Consumption)
Potential Action-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Air	Massachusetts DEP Air Pollution Control Regulations (310 CMR 7.00)	Applicable	These regulations set requirements for fugitive emissions, dust, and particulates.	*
Soil	Massachusetts DEP Solid Waste Regulations (310 CMR 19.00)	Relevant and Appropriate	This regulation may be relevant and appropriate for landfill gas issues.	**
	Massachusetts DEP Hazardous Waste Regulations (310 CMR 30.000)	Relevant and Appropriate	These regulations describe the requirements for treatment, storage, and disposal of hazardous waste.	**
FEDERAL REGULATORY REQUIREMENTS				
Air	Federal RCRA Air Emission Standards for Equipment Leaks (40 CFR Part 264, Subpart BB)	Relevant and Appropriate, if treatment involves groundwater with organic concentration of at least 10% by weight.	Standards for air emissions for equipment that contains or contacts RCRA wastes with organic concentrations of at least 10% by weight.	***
	Federal RCRA Air Emission Standards for Process Vents (40 CFR Part 264, Subpart AA)	Relevant and Appropriate, if threshold concentrations are met	Standards for air emissions from process vents associated with distillation, fractionation, thin film evaporation, column extraction or air steam stripping operations that treat RCRA substances and have total organic concentrations of 10 ppm or greater.	***
	Federal Clean Air Act - Non-Methane Organic Compounds (40 CFR Part 60, Subpart WWW)	Relevant and Appropriate, if threshold concentrations are met	Regulations require NMOC-specific gas collection and control systems, monitoring, and gas generation estimates. The rule establishes a performance standard for NMOCs emissions of greater than 50 megagrams/year from municipal solid waste landfills.	***
	National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Clean Air Act (40 CFR 61, Subparts H and I)	Relevant and Appropriate	Regulates air emissions of VOCs and radionuclides.	*

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* These requirements will be met during all construction activities.

** The requirements that address landfills will be met in the construction of and operation of the landfill cap.

*** If these are determined to be relevant and appropriate, then substantive requirements will be met in addressing emission from landfill.

Table 1C
Alternative SC-2B - Multi-Barrier Cap/Consolidation of Radiological Material (Adjacent Resident Without Groundwater Consumption)
Potential Action-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
FEDERAL REGULATORY REQUIREMENTS				
Soil	Toxic Substances Control Act (TSCA) (15 USC 2601)	Applicable	Soil containing > 50 ppm PCBs are regulated under this Act.	**
	Federal RCRA Subtitle C (40 CFR Part 264 Subpart N - Landfills, Section 264.310)	Relevant and Appropriate	Requirements for Hazardous Waste landfill closure.	*
	Federal RCRA Subtitle C (40 CFR Part 264 Subpart G - Closure and Post Closure, Sections 264.111, 264.114, and 264.117)	Relevant and Appropriate	Establishes performance standards for closure of hazardous waste landfills and groundwater monitoring.	*
	Federal RCRA Subtitle C (40 CFR Part 264 Subpart B - General Facility Standards, Section 264.19)	Relevant and Appropriate	Requirements for developing a Construction Quality Assurance Program for final cover system.	*
	USEPA Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments (EPA / 530-SW-89-047)	To Be Considered	Presents technical specifications for the design of multi-barrier covers at landfills at which hazardous wastes were disposed.	*
	Technical Memorandum: Revised Landfill Cap Design Guidance Proposed for Unlined, Hazardous Waste Landfills in EPA Region I (5 Feb 2001)	To Be Considered	Provides guidance for landfill cap design for unlined, hazardous waste landfills at Superfund landfill sites in EPA Region I.	*
Groundwater	Federal Ambient Water Quality Criteria (AWQC) (CWA 303)	Relevant and Appropriate	Federal AWQC are health-based criteria which have been developed for certain carcinogenic and noncarcinogenic compounds.	***
	Federal RCRA Subtitle C Regulations (40 CFR Part 264 Subpart F - Releases from Solid Waste Management Units, Sections 264.95, 264.96(a) and (c), 264.97, 264.98 and 264.99)	Relevant and Appropriate	Groundwater monitoring requirements and compliance points for determining the need for additional monitoring and corrective action.	****

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* The requirements will be met in the design, construction and operation of the land fill cap.

** Should PCBs be encountered during excavation / consolidation, they will be addressed consisting with these requirements.

*** These criteria will be used to determine whether this alternative minimizes the impacts of the site to surface water.

**** Groundwater monitoring will be conducted to determine the effectiveness of the remedy.

Table 1C
Alternative SC-2B - Multi-Barrier Cap/Consolidation of Radiological Material (Adjacent Resident Without Groundwater Consumption)
Potential Radiological-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements
STATE REGULATORY REQUIREMENTS			
Soil / Groundwater	Massachusetts Regulations for Control of Radiation (105 CMR 120)	Relevant and Appropriate	Establishes standards for radiation related activities.
FEDERAL REGULATORY REQUIREMENTS			
Air	National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Clean Air Act (40 CFR 61, Subparts H and I)	Relevant and Appropriate	Provides guidance on air emissions of radionuclides during cleanup of Federal Facilities and licensed NRC facilities with radioactive contamination.
Groundwater	Ore Mining and Dressing Point Source Category (40 CFR 440, Subpart C)	Relevant and Appropriate	Regulates effluent limits from facilities that extract / process uranium, radium and vanadium ores. May be applicable to discharges of radioactive waste to surface waters.
	Federal Water Quality Criteria (FWQC) and State Water Quality Standards (Water Quality Criteria, Report of the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1986)	To be considered	FWQC are criteria / standards for the protection of aquatic life and / or human health.
	Health and Environmental Protection for Uranium and Thorium Tailings (40 CFR 192, Subpart A, Table 1)	Relevant and Appropriate	Standards have been developed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for sites that are exempt from CERCLA for radium / thorium in soil.
	Federal Safe Drinking Water Act - Maximum Contaminant Levels (MCLs) for Radiological Constituents (40 CFR 141 Subparts B, G and I)	Applicable, if non-zero	MCLs have been promulgated for a number of radiological constituents. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered appropriate for groundwater aquifers potentially used for drinking water.
Soil	Health and Environmental Protection for Uranium and Thorium Tailings (40 CFR 192.12, 192.32, 192.41)	Relevant and Appropriate	Standards have been developed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for sites that are exempt from CERCLA for radium / thorium in soil.
	Licensing Requirements for Land Disposal of Radioactive Waste (10 CFR 61.41)	Relevant and Appropriate	Provides performance objectives for licensed disposal sites containing low level radioactive waste if the waste will be left permanently on site.

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

See chemical-, action-, and location-specific ARAR tables for a discussion of how the radiological-specific ARARs are addressed, if at all, by this alternative.

Table 1D
Alternative SC-2C - Multi-Barrier Cap/Consolidation of Radiological Material (Adjacent Resident With Groundwater Consumption)
Potential Chemical-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Soil / Groundwater	Massachusetts Regulations for Control of Radiation (105 CMR 120)	Relevant and Appropriate	Establishes standards for radiation related activities.	*
Groundwater	Massachusetts Department of Environmental Protection (DEP) Drinking Water Standards 310 CMR 22.00 (March, 1997) and Addendum (June, 1999)	Relevant and Appropriate	Maximum Contaminant Limits regulate the concentration of contaminants in public drinking water supplies.	**
	Massachusetts Groundwater Quality Standards (314 CMR 6.00)	Relevant and Appropriate	These standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected, and set forth water quality criteria necessary to maintain the designated areas. GW-3 and GW-1 groundwater standards apply to the site.	**
FEDERAL REGULATORY REQUIREMENTS				
Non-Environmental Materials	Department of the Army, USACE EM-385-1-80, Table 6-4	To be Considered	This USACE Radiation Protection Manual table sets acceptable surface contamination levels for U-nat, U-235, U-238 and associated decay products for release of equipment and non-environmental materials (e.g., old kitchen appliances).	*
Soil	Domestic Licensing of Source Material (10 CFR 40, Appendix A, I Criterion 6(6))	Relevant and Appropriate	Establishes benchmark approach for setting clean-up levels for radionuclides.	*
	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR Part 192)	Relevant and Appropriate	Establishes concentration limits for clean-up of Ra-226, Ra-228 and thorium in soil.	*
	Use of Soil Clean-up Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites, Directive No. 9200.4-25, February 12, 1998.	To be Considered	Addresses use of soil clean-up criteria in 40 CFR 192 in setting remediation levels for subsurface soil at CERCLA sites with radioactive contamination.	*
	Remediation Goals for Radioactively-Contaminated CERCLA Site Using the Benchmark Dose Clean-Up Criteria in 10 CFR 40, Appendix A, I, Criterion 6(6), Directive No. 9200-4-35P, April 11, 2000.	To be Considered	Addresses the use of the soil and structure clean-up criteria in 10 CFR 40, Appendix A, I, Criterion 6(6) with setting remediation goals at CERCLA sites with radioactive contamination.	*
Groundwater	Federal Safe Drinking Water Act - Maximum Contaminated Levels (MCLs) for Organic and Inorganic Chemicals (40 CFR 141 Subparts B, G and I)	Relevant and Appropriate	Promulgates MCLs for a number of common organic and inorganic chemicals and action levels for lead and copper. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered appropriate for groundwater aquifers potentially used for drinking water.	**
	Federal Safe Drinking Water Act - non-zero Maximum Contaminant Level Goals (MCLGs) for Organic and Inorganic Chemicals (40 CFR 141 Subpart F)	Relevant and Appropriate	Establishes MCLGs for organic and inorganic contaminants. MCLGs that are non-zero will be relevant and appropriate.	**
	USEPA Reference Doses (RfDs) and EPA Carcinogen Assessment Group Potency Factors	To Be Considered	RfD is an estimate of a daily oral exposure to human population that is likely to be without an appreciable risk of noncancer effects. The Cancer Group Potency Factors are being used as a qualitative weight-of-evidence judgement to the likelihood of a chemical being a carcinogen.	**
	USEPA Health Advisories	To Be Considered	Health Advisory is an estimate of acceptable drinking water levels for a chemical based on health effects.	**
Sediment	Ontario Ministry of the Environment Sediment Quality Guidelines	To Be Considered	The Sediment Quality Guidelines present scientific data and guidance on the environmental effects of pollutants. The criteria can contribute to establishing requirements that govern impacts to sediment quality.	***

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Will be met through excavation and off-site disposal of radiological materials.

** Will not be met due to presence of off-site source.

*** Will be met through excavation and off-site disposal of radiological materials and capping of chemical contaminants.

Table 1D
Alternative SC-2C - Multi-Barrier Cap/Consolidation of Radiological Material (Adjacent Resident With Groundwater Consumption)
Potential Location-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Wetland Sediment	Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00)	Applicable	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling altering or polluting inland wetlands. This requirement regulates work within the wetlands buffer zone, and defines wetlands based on vegetation type and mitigation requirements.	***
	401 Water Quality Certification for Discharge of Dredged or Fill Material (314 CMR 9.00)	Applicable	ARAR if discharge of dredged or fill material occurs.	***
	Massachusetts Endangered Species Act (321 CMR 10.00)	Applicable	Requires that site activities be conducted in a manner that minimizes impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	**
FEDERAL REGULATORY REQUIREMENTS				
Wetland Sediment	Federal Executive Order on Protection of Wetlands (E.O. 11990, 40 CFR Part 6, Appendix A)	Applicable	Requires federal agencies to avoid impacts associated with the destruction or loss of wetlands, minimize potential harm, preserve and enhance wetlands, and avoid support of new construction in wetlands if a practicable alternative exists.	*
	Federal Fish and Wildlife Coordination Act (16 USC 661 et. seq., 40 CFR Part 6)	Applicable	Establishes requirements for a consultation with U.S. Fish and Wildlife Service and state wildlife agencies to mitigate losses of fish and wildlife that result from modification of a water body.	****
	Federal Clean Water Act (33 USC 1344), US Army Corps of Engineers Nationwide Permit Program (33 CFR Part 330), "Federal Guidelines for Specification of Disposal Sites" (40 CFR Part 230), Clean Water Act Sections 401 and 404 (33 CFR 26)	Applicable	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative that has less effect is available. The requirements also describe actions to minimize adverse impacts. Establishes regulations for filling and dredging within wetlands.	*
	Endangered Species Act (50 CFR Parts 17.11-12)	Applicable	Requires site action be conducted in a manner that avoids harming threatened or endangered species or their habitat.	**

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Because high levels of contamination exist in wetlands area, there is no practical alternative to excavating wetlands areas. Actions will be taken to minimize impacts to the maximum extent practical.

** Should threatened, protected or endangered species be encountered, the requirements of these regulations will be met.

*** Because excavation is required in the wetlands / buffer zone, all substantive requirements of these regulations will be met.

**** Should this alternative require modification of a water body, this consultation requirement will be conducted.

Table 1D
Alternative SC-2C - Multi-Barrier Cap/Consolidation of Radiological Material (Adjacent Resident With Groundwater Consumption)
Potential Action-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Air	Massachusetts DEP Air Pollution Control Regulations (310 CMR 7.00)	Applicable	These regulations set requirements for fugitive emissions, dust, and particulates.	*
Soil	Massachusetts DEP Solid Waste Regulations (310 CMR 19.00)	Relevant and Appropriate	This regulation may be relevant and appropriate for landfill gas issues.	**
	Massachusetts DEP Hazardous Waste Regulations (310 CMR 30.000)	Relevant and Appropriate	These regulations describe the requirements for treatment, storage, and disposal of hazardous waste.	**
FEDERAL REGULATORY REQUIREMENTS				
Air	Federal RCRA Air Emission Standards for Equipment Leaks (40 CFR Part 264, Subpart BB)	Relevant and Appropriate, if treatment involves groundwater with organic concentration of at least 10% by weight.	Standards for air emissions for equipment that contains or contacts RCRA wastes with organic concentrations of at least 10% by weight.	***
	Federal RCRA Air Emission Standards for Process Vents (40 CFR Part 264, Subpart AA)	Relevant and Appropriate, if threshold concentrations are met	Standards for air emissions from process vents associated with distillation, fractionation, thin film evaporation, column extraction or air steam stripping operations that treat RCRA substances and have total organic concentrations of 10 ppm or greater.	***
	Federal Clean Air Act - Non-Methane Organic Compounds (40 CFR Part 60, Subpart WWW)	Relevant and Appropriate, if threshold concentrations are met	Regulations require NMOC-specific gas collection and control systems, monitoring, and gas generation estimates. The rule establishes a performance standard for NMOCs emissions of greater than 50 megagrams/year from municipal solid waste landfills.	***
	National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Clean Air Act (40 CFR 61, Subparts H and I)	Relevant and Appropriate	Regulates air emissions of VOCs and radionuclides.	*

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* These requirements will be met during all construction activities.

** The requirements that address landfills will be met in the construction of and operation of the landfill cap.

*** If these are determined to be relevant and appropriate, then substantive requirements will be met in addressing emission from landfill.

Table 1D
Alternative SC-2C - Multi-Barrier Cap/Consolidation of Radiological Material (Adjacent Resident With Groundwater Consumption)
Potential Action-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
FEDERAL REGULATORY REQUIREMENTS				
Soil	Toxic Substances Control Act (TSCA) (15 USC 2601)	Applicable	Soil containing > 50 ppm PCBs are regulated under this Act.	**
	Federal RCRA Subtitle C (40 CFR Part 264 Subpart N - Landfills, Section 264.310)	Relevant and Appropriate	Requirements for Hazardous Waste landfill closure.	*
	Federal RCRA Subtitle C (40 CFR Part 264 Subpart G - Closure and Post Closure, Sections 264.111, 264.114, and 264.117)	Relevant and Appropriate	Establishes performance standards for closure of hazardous waste landfills and groundwater monitoring.	*
	Federal RCRA Subtitle C (40 CFR Part 264 Subpart B - General Facility Standards, Section 264.19)	Relevant and Appropriate	Requirements for developing a Construction Quality Assurance Program for final cover system.	*
	USEPA Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments (EPA/530-SW-89-047)	To Be Considered	Presents technical specifications for the design of multi-barrier covers at landfills at which hazardous wastes were disposed.	*
	Technical Memorandum: Revised Landfill Cap Design Guidance Proposed for Unlined, Hazardous Waste Landfills in EPA Region I (5 Feb 2001)	To Be Considered	Provides guidance for landfill cap design for unlined, hazardous waste landfills at Superfund landfill sites in EPA Region I.	*
Groundwater	Federal Ambient Water Quality Criteria (AWQC) (CWA 303)	Relevant and Appropriate	Federal AWQC are health-based criteria which have been developed for certain carcinogenic and noncarcinogenic compounds.	***
	Federal RCRA Subtitle C Regulations (40 CFR Part 264 Subpart F - Releases from Solid Waste Management Units, Sections 264.95, 264.96(a) and (c), 264.97, 264.98 and 264.99)	Relevant and Appropriate	Groundwater monitoring requirements and compliance points for determining the need for additional monitoring and corrective action.	****

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* The requirements will be met in the design, construction and operation of the land fill cap.

** Should PCBs be encountered during excavation/consolidation, they will be addressed consisting with these requirements.

*** These criteria will be used to determine whether this alternative minimizes the impacts of the site to surface water.

**** Groundwater monitoring will be conducted to determine the effectiveness of the remedy.

Table 1D
Alternative SC-2C - Multi-Barrier Cap/Consolidation of Radiological Material (Adjacent Resident With Groundwater Consumption)
Potential Radiological-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements
STATE REGULATORY REQUIREMENTS			
Soil / Groundwater	Massachusetts Regulations for Control of Radiation (105 CMR 120)	Relevant and Appropriate	Establishes standards for radiation related activities.
FEDERAL REGULATORY REQUIREMENTS			
Air	National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Clean Air Act (40 CFR 61, Subparts H and I)	Relevant and Appropriate	Provides guidance on air emissions of radionuclides during cleanup of Federal Facilities and licensed NRC facilities with radioactive contamination.
Groundwater	Ore Mining and Dressing Point Source Category (40 CFR 440, Subpart C)	Relevant and Appropriate	Regulates effluent limits from facilities that extract / process uranium, radium and vanadium ores. May be applicable to discharges of radioactive waste to surface waters.
	Federal Water Quality Criteria (FWQC) and State Water Quality Standards (Water Quality Criteria, Report of the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1986)	To be considered	FWQC are criteria / standards for the protection of aquatic life and / or human health.
	Health and Environmental Protection for Uranium and Thorium Tailings (40 CFR 192, Subpart A, Table 1)	Relevant and Appropriate	Standards have been developed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for sites that are exempt from CERCLA for radium / thorium in soil.
	Federal Safe Drinking Water Act - Maximum Contaminant Levels (MCLs) for Radiological Constituents (40 CFR 141 Subparts B, G and I)	Applicable, if non-zero	MCLs have been promulgated for a number of radiological constituents. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered appropriate for groundwater aquifers potentially used for drinking water.
Soil	Health and Environmental Protection for Uranium and Thorium Tailings (40 CFR 192.12, 192.32, 192.41)	Relevant and Appropriate	Standards have been developed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for sites that are exempt from CERCLA for radium / thorium in soil.
	Licensing Requirements for Land Disposal of Radioactive Waste (10 CFR 61.41)	Relevant and Appropriate	Provides performance objectives for licensed disposal sites containing low level radioactive waste if the waste will be left permanently on site.

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

See chemical-, action-, and location-specific ARAR tables for a discussion of how the radiological-specific ARARs are addressed, if at all, by this alternative.

Table 1E
Alternative SC-2D - Multi-Barrier Cap/Consolidation of Radiological Material (On-Site Resident)
Potential Chemical-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Soil / Groundwater	Massachusetts Regulations for Control of Radiation (105 CMR 120)	Relevant and Appropriate	Establishes standards for radiation related activities.	*
Groundwater	Massachusetts Department of Environmental Protection (DEP) Drinking Water Standards 310 CMR 22.00 (March, 1997) and Addendum (June, 1999)	Relevant and Appropriate if groundwater remains designated as drinking water / potential drinking water source	Maximum Contaminant Limits regulate the concentration of contaminants in public drinking water supplies.	**
	Massachusetts Groundwater Quality Standards (314 CMR 6.00)	Relevant and Appropriate if groundwater remains designated as drinking water / potential drinking water source	These standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected, and set forth water quality criteria necessary to maintain the designated areas. GW-3 and GW-1 groundwater standards apply to the site.	**
FEDERAL REGULATORY REQUIREMENTS				
Non-Environmental Materials	Department of the Army, USACE EM-385-1-80, Table 6-4	To be Considered	This USACE Radiation Protection Manual table sets acceptable surface contamination levels for U-nat, U-235, U-238 and associated decay products for release of equipment and non-environmental materials (e.g., old kitchen appliances).	*
Soil	Domestic Licensing of Source Material (10 CFR 40, Appendix A, I Criterion 6(6))	Relevant and Appropriate	Establishes benchmark approach for setting clean-up levels for radionuclides.	*
	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR Part 192)	Relevant and Appropriate	Establishes concentration limits for clean-up of Ra-226, Ra-228 and thorium in soil.	*
	Use of Soil Clean-up Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites, Directive No. 9200.4-25, February 12, 1998.	To be Considered	Addresses use of soil clean-up criteria in 40 CFR 192 in setting remediation levels for subsurface soil at CERCLA sites with radioactive contamination.	*
	Remediation Goals for Radioactively-Contaminated CERCLA Site Using the Benchmark Dose Clean-Up Criteria in 10 CFR 40, Appendix A, I, Criterion 6(6), Directive No. 9200-4-35P, April 11, 2000.	To be Considered	Addresses the use of the soil and structure clean-up criteria in 10 CFR 40, Appendix A, I, Criterion 6(6) with setting remediation goals at CERCLA sites with radioactive contamination.	*
Groundwater	Federal Safe Drinking Water Act - Maximum Contaminated Levels (MCLs) for Organic and Inorganic Chemicals (40 CFR 141 Subparts B, G and I)	Relevant and Appropriate if groundwater remains designated as drinking water / potential drinking water source	Promulgates MCLs for a number of common organic and inorganic chemicals and action levels for lead and copper. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered appropriate for groundwater aquifers potentially used for drinking water.	**
	Federal Safe Drinking Water Act - non-zero Maximum Contaminant Level Goals (MCLGs) for Organic and Inorganic Chemicals (40 CFR 141 Subpart F)	Relevant and Appropriate if groundwater remains designated as drinking water / potential drinking water source	Establishes MCLGs for organic and inorganic contaminants. MCLGs that are non-zero will be relevant and appropriate.	**
	USEPA Reference Doses (RfDs) and EPA Carcinogen Assessment Group Potency Factors	To Be Considered	RfD is an estimate of a daily oral exposure to human population that is likely to be without an appreciable risk of noncancer effects. The Cancer Group Potency Factors are used as a qualitative weight-of-evidence judgement to the likelihood of a chemical being a carcinogen.	**
	USEPA Health Advisories	To Be Considered	Health Advisory is an estimate of acceptable drinking water levels for a chemical based on health effects.	**
Sediment	Ontario Ministry of the Environment Sediment Quality Guidelines	To Be Considered	The Sediment Quality Guidelines present scientific data and guidance on the environmental effects of pollutants. The criteria can contribute to establishing requirements that govern impacts to sediment quality.	***

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Will be met through excavation and off-site disposal of radiological material.

** Will not be met due to presence of off-site source.

*** Will be met through excavation and off-site disposal of radiological material and capping of chemical contamination.

Table 1E
Alternative SC-2D - Multi-Barrier Cap/Consolidation of Radiological Material (On-Site Resident)
Potential Location-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Wetland Sediment	Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00)	Applicable	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling altering or polluting inland wetlands. This requirement regulates work within the wetlands buffer zone, and defines wetlands based on vegetation type and mitigation requirements.	***
	401 Water Quality Certification for Discharge of Dredged or Fill Material (314 CMR 9.00)	Applicable	ARAR if discharge of dredged or fill material occurs.	***
	Massachusetts Endangered Species Act (321 CMR 10.00)	Applicable	Requires that site activities be conducted in a manner that minimizes impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	**
FEDERAL REGULATORY REQUIREMENTS				
Wetland Sediment	Federal Executive Order on Protection of Wetlands (E.O. 11990, 40 CFR Part 6, Appendix A)	Applicable	Requires federal agencies to avoid impacts associated with the destruction or loss of wetlands, minimize potential harm, preserve and enhance wetlands, and avoid support of new construction in wetlands if a practicable alternative exists.	*
	Federal Fish and Wildlife Coordination Act (16 USC 661 et. seq., 40 CFR Part 6)	Applicable	Establishes requirements for a consultation with U.S. Fish and Wildlife Service and state wildlife agencies to mitigate losses of fish and wildlife that result from modification of a water body.	****
	Federal Clean Water Act (33 USC 1344), US Army Corps of Engineers Nationwide Permit Program (33 CFR Part 330), "Federal Guidelines for Specification of Disposal Sites" (40 CFR Part 230), Clean Water Act Sections 401 and 404 (33 CFR 26)	Applicable	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative that has less effect is available. The requirements also describe actions to minimize adverse impacts. Establishes regulations for filling and dredging within wetlands.	*
	Endangered Species Act (50 CFR Parts 17.11-12)	Applicable	Requires site action be conducted in a manner that avoids harming threatened or endangered species or their habitat.	**

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Because high levels of contamination exist in wetlands area, there is no practical alternative to excavating wetlands areas. Actions will be taken to minimize impacts to the maximum extent practical.

** Should threatened, protected or endangered species be encountered, the requirements of these regulations will be met.

*** Because excavation is required in the wetlands / buffer zone, all substantive requirements of these regulations will be met.

**** Should this alternative require modification of a water body, this consultation requirement will be conducted.

Table 1E
Alternative SC-2D - Multi-Barrier Cap/Consolidation of Radiological Material (On-Site Resident)
Potential Action-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Air	Massachusetts DEP Air Pollution Control Regulations (310 CMR 7.00)	Applicable	These regulations set requirements for fugitive emissions, dust, and particulates.	*
Soil	Massachusetts DEP Solid Waste Regulations (310 CMR 19.00)	Relevant and Appropriate	This regulation may be relevant and appropriate for landfill gas issues.	**
	Massachusetts DEP Hazardous Waste Regulations (310 CMR 30.000)	Relevant and Appropriate	These regulations describe the requirements for treatment, storage, and disposal of hazardous waste.	**
FEDERAL REGULATORY REQUIREMENTS				
Air	Federal RCRA Air Emission Standards for Equipment Leaks (40 CFR Part 264, Subpart BB)	Relevant and Appropriate, if treatment involves groundwater with organic concentration of at least 10% by weight.	Standards for air emissions for equipment that contains or contacts RCRA wastes with organic concentrations of at least 10% by weight.	***
	Federal RCRA Air Emission Standards for Process Vents (40 CFR Part 264, Subpart AA)	Relevant and Appropriate, if threshold concentrations are met	Standards for air emissions from process vents associated with distillation, fractionation, thin film evaporation, column extraction or air steam stripping operations that treat RCRA substances and have total organic concentrations of 10 ppm or greater.	***
	Federal Clean Air Act - Non-Methane Organic Compounds (40 CFR Part 60, Subpart WWW)	Relevant and Appropriate, if threshold concentrations are met	Regulations require NMOC-specific gas collection and control systems, monitoring, and gas generation estimates. The rule establishes a performance standard for NMOCs emissions of greater than 50 megagrams/year from municipal solid waste landfills.	***
	National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Clean Air Act (40 CFR 61, Subparts H and I)	Relevant and Appropriate	Regulates air emissions of VOCs and radionuclides.	*

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* These requirements will be met during all construction activities.

** The requirements that address landfills will be met in the construction of and operation of the landfill cap.

*** If these are determined to be relevant and appropriate, then substantive requirements will be met in addressing emission from landfill.

Table 1E
Alternative SC-2D - Multi-Barrier Cap/Consolidation of Radiological Material (On-Site Resident)
Potential Action-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
FEDERAL REGULATORY REQUIREMENTS				
Soil	Toxic Substances Control Act (TSCA) (15 USC 2601)	Applicable	Soil containing > 50 ppm PCBs are regulated under this Act.	**
	Federal RCRA Subtitle C (40 CFR Part 264 Subpart N - Landfills, Section 264.310)	Relevant and Appropriate	Requirements for Hazardous Waste landfill closure.	*
	Federal RCRA Subtitle C (40 CFR Part 264 Subpart G - Closure and Post Closure, Sections 264.111, 264.114, and 264.117)	Relevant and Appropriate	Establishes performance standards for closure of hazardous waste landfills and groundwater monitoring.	*
	Federal RCRA Subtitle C (40 CFR Part 264 Subpart B - General Facility Standards, Section 264.19)	Relevant and Appropriate	Requirements for developing a Construction Quality Assurance Program for final cover system.	*
	USEPA Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments (EPA/530-SW-89-047)	To Be Considered	Presents technical specifications for the design of multi-barrier covers at landfills at which hazardous wastes were disposed.	*
	Technical Memorandum: Revised Landfill Cap Design Guidance Proposed for Unlined, Hazardous Waste Landfills in EPA Region I (5 Feb 2001)	To Be Considered	Provides guidance for landfill cap design for unlined, hazardous waste landfills at Superfund landfill sites in EPA Region I.	*
Groundwater	Federal Ambient Water Quality Criteria (AWQC) (CWA 303)	Relevant and Appropriate	Federal AWQC are health-based criteria which have been developed for certain carcinogenic and noncarcinogenic compounds.	***
	Federal RCRA Subtitle C Regulations (40 CFR Part 264 Subpart F - Releases from Solid Waste Management Units, Sections 264.95, 264.96(a) and (c), 264.97, 264.98 and 264.99)	Relevant and Appropriate	Groundwater monitoring requirements and compliance points for determining the need for additional monitoring and corrective action.	****

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* The requirements will be met in the design, construction and operation of the land fill cap.

** Should PCBs be encountered during excavation/consolidation, they will be addressed consisting with these requirements.

*** These criteria will be used to determine whether this alternative minimizes the impacts of the site to surface water.

**** Groundwater monitoring will be conducted to determine the effectiveness of the remedy.

Table 1E
Alternative SC-2D - Multi-Barrier Cap/Consolidation of Radiological Material (On-Site Resident)
Potential Radiological-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements
STATE REGULATORY REQUIREMENTS			
Soil / Groundwater	Massachusetts Regulations for Control of Radiation (105 CMR 120)	Relevant and Appropriate	Establishes standards for radiation related activities.
FEDERAL REGULATORY REQUIREMENTS			
Air	National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Clean Air Act (40 CFR 61, Subparts H and I)	Relevant and Appropriate	Provides guidance on air emissions of radionuclides during cleanup of Federal Facilities and licensed NRC facilities with radioactive contamination.
Groundwater	Ore Mining and Dressing Point Source Category (40 CFR 440, Subpart C)	Relevant and Appropriate	Regulates effluent limits from facilities that extract / process uranium, radium and vanadium ores. May be applicable to discharges of radioactive waste to surface waters.
	Federal Water Quality Criteria (FWQC) and State Water Quality Standards (Water Quality Criteria, Report of the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1986)	To be considered	FWQC are criteria / standards for the protection of aquatic life and / or human health.
	Health and Environmental Protection for Uranium and Thorium Tailings (40 CFR 192, Subpart A, Table 1)	Relevant and Appropriate	Standards have been developed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for sites that are exempt from CERCLA for radium / thorium in soil.
	Federal Safe Drinking Water Act - Maximum Contaminant Levels (MCLs) for Radiological Constituents (40 CFR 141 Subparts B, G and I)	Applicable, if non-zero	MCLs have been promulgated for a number of radiological constituents. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered appropriate for groundwater aquifers potentially used for drinking water.
Soil	Health and Environmental Protection for Uranium and Thorium Tailings (40 CFR 192.12, 192.32, 192.41)	Relevant and Appropriate	Standards have been developed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for sites that are exempt from CERCLA for radium / thorium in soil.
	Licensing Requirements for Land Disposal of Radioactive Waste (10 CFR 61.41)	Relevant and Appropriate	Provides performance objectives for licensed disposal sites containing low level radioactive waste if the waste will be left permanently on site.

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

See chemical-, action-, and location-specific ARAR tables for a discussion of how the radiological-specific ARARs are addressed, if at all, by this alternative.

Table 1F
Alternative SC-3A - Excavation/Off-Site Disposal (Recreational User)
Potential Chemical-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Soil/ Groundwater	Massachusetts Regulations for Control of Radiation (105 CMR 120)	Relevant and Appropriate	Establishes standards for radiation related activities.	*
Groundwater	Massachusetts Department of Environmental Protection (DEP) Drinking Water Standards 310 CMR 22.00 (March, 1997) and Addendum (June, 1999)	Relevant and Appropriate if groundwater remains designated as drinking water/ potential drinking water source	Maximum Contaminant Limits regulate the concentration of contaminants in public drinking water supplies.	**
	Massachusetts Groundwater Quality Standards (314 CMR 6.00)	Relevant and Appropriate if groundwater remains designated as drinking water/ potential drinking water source	These standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected, and set forth water quality criteria necessary to maintain the designated areas. GW-3 and GW-1 groundwater standards apply to the site.	**
FEDERAL REGULATORY REQUIREMENTS				
Non-Environmental Materials	Department of the Army, USACE EM-385-1-80, Table 6-4	To be Considered	This USACE Radiation Protection Manual table sets acceptable surface contamination levels for U-nat, U-235, U-238 and associated decay products for release of equipment and non-environmental materials (e.g., old kitchen appliances).	*
Soil	Domestic Licensing of Source Material (10 CFR 40, Appendix A, I Criterion 6(6))	Relevant and Appropriate	Establishes benchmark approach for setting clean-up levels for radionuclides.	*
	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR Part 192)	Relevant and Appropriate	Establishes concentration limits for clean-up of Ra-226, Ra-228 and thorium in soil.	*
	Use of Soil Clean-up Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites, Directive No. 9200.4-25, February 12, 1998.	To be Considered	Addresses use of soil clean-up criteria in 40 CFR 192 in setting remediation levels for subsurface soil at CERCLA sites with radioactive contamination.	*
	Remediation Goals for Radioactively-Contaminated CERCLA Site Using the Benchmark Dose Clean-Up Criteria in 10 CFR 40, Appendix A, I, Criterion 6(6), Directive No. 9200-4-35P, April 11, 2000.	To be Considered	Addresses the use of the soil and structure clean-up criteria in 10 CFR 40, Appendix A, I, Criterion 6(6) with setting remediation goals at CERCLA sites with radioactive contamination.	*
Groundwater	Federal Safe Drinking Water Act - Maximum Contaminated Levels (MCLs) for Organic and Inorganic Chemicals (40 CFR 141 Subparts B, G and I)	Relevant and Appropriate if groundwater remains designated as drinking water/ potential drinking water source	Promulgates MCLs for a number of common organic and inorganic chemicals and action levels for lead and copper. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered appropriate for groundwater aquifers potentially used for drinking water.	**
	Federal Safe Drinking Water Act - non-zero Maximum Contaminant Level Goals (MCLGs) for Organic and Inorganic Chemicals (40 CFR 141 Subpart F)	Relevant and Appropriate if groundwater remains designated as drinking water/ potential drinking water source	Establishes MCLGs for organic and inorganic contaminants. MCLGs that are non-zero will be relevant and appropriate.	**
	USEPA Reference Doses (RfDs) and EPA Carcinogen Assessment Group Potency Factors	To Be Considered	RfD is an estimate of a daily oral exposure to human population that is likely to be without an appreciable risk of noncancer effects. The Cancer Group Potency Factors are used as a qualitative weight-of-evidence judgement to the likelihood of a chemical being a carcinogen.	*
	USEPA Health Advisories	To Be Considered	Health Advisory is an estimate of acceptable drinking water levels for a chemical based on health effects.	*
Sediment	Ontario Ministry of the Environment Sediment Quality Guidelines	To Be Considered	The Sediment Quality Guidelines present scientific data and guidance on the environmental effects of pollutants. The criteria can contribute to establishing requirements that govern impacts to sediment quality.	*

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Will be met through excavation and off-site disposal of radiological and chemical waste.

** Will not be met due to presence of off-site source.

Table 1F
Alternative SC-3A - Excavation/Off-Site Disposal (Recreational User)
Potential Location-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Wetland Sediment	Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00)	Applicable	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling altering or polluting inland wetlands. This requirement regulates work within the wetlands buffer zone, and defines wetlands based on vegetation type and mitigation requirements.	***
	401 Water Quality Certification for Discharge of Dredged or Fill Material (314 CMR 9.00)	Applicable	ARAR if discharge of dredged or fill material occurs.	***
	Massachusetts Endangered Species Act (321 CMR 10.00)	Applicable	Requires that site activities be conducted in a manner that minimizes impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	**
FEDERAL REGULATORY REQUIREMENTS				
Wetland Sediment	Federal Executive Order on Protection of Wetlands (E.O. 11990, 40 CFR Part 6, Appendix A)	Applicable	Requires federal agencies to avoid impacts associated with the destruction or loss of wetlands, minimize potential harm, preserve and enhance wetlands, and avoid support of new construction in wetlands if a practicable alternative exists.	*
	Federal Fish and Wildlife Coordination Act (16 USC 661 et. seq., 40 CFR Part 6)	Applicable	Establishes requirements for a consultation with U.S. Fish and Wildlife Service and state wildlife agencies to mitigate losses of fish and wildlife that result from modification of a water body.	****
	Federal Clean Water Act (33 USC 1344), US Army Corps of Engineers Nationwide Permit Program (33 CFR Part 330), "Federal Guidelines for Specification of Disposal Sites" (40 CFR Part 230), Clean Water Act Sections 401 and 404 (33 CFR 26)	Applicable	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative that has less effect is available. The requirements also describe actions to minimize adverse impacts. Establishes regulations for filling and dredging within wetlands.	*
	Endangered Species Act (50 CFR Parts 17.11-12)	Applicable	Requires site action be conducted in a manner that avoids harming threatened or endangered species or their habitat.	**

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Because high levels of contamination exist in wetlands area, there is no practical alternative to excavating wetlands areas. Actions will be taken to minimize impacts to the maximum extent practical.

** Should threatened, protected or endangered species be encountered, the requirements of these regulations will be met.

*** Because excavation is required in the wetlands / buffer zone, all substantive requirements of these regulations will be met.

**** Should this alternative require modification of a water body, this consultation requirement will be conducted.

Table 1F
Alternative SC-3A - Excavation/Off-Site Disposal (Recreational User)
Potential Action-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Air	Massachusetts DEP Air Pollution Control Regulations (310 CMR 7.00)	Applicable	These regulations set requirements for fugitive emissions, dust, and particulates.	*
Soil	Massachusetts DEP Hazardous Waste Regulations (310 CMR 30.000)	Relevant and Appropriate	These regulations describe the requirements for treatment, storage, and disposal of hazardous waste.	**
FEDERAL REGULATORY REQUIREMENTS				
Air	National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Clean Air Act (40 CFR 61, Subparts H and I)	Relevant and Appropriate	Regulates air emissions of VOCs and radionuclides.	* **

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Excavation activities will be conducted to meet the requirements of these regulations.

** Substantive landfill closure requirements that address clean closure will be met by this alternative.

Table 1F
Alternative SC-3A - Excavation/Off-Site Disposal (Recreational User)
Potential Action-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
FEDERAL REGULATORY REQUIREMENTS				
Non-Environmental Materials	Department of the Army, USACE EM-385-1-80, Table 6-4	To be Considered	This USACE Radiation Protection Manual table sets acceptable surface contamination levels for U-nat, U-235, U-238 and associated decay products for release of equipment and non-environmental materials (e.g., old kitchen appliances).	†
Soil	Domestic Licensing of Source Material (10 CFR 40, Appendix A, I Criterion 6(6))	Relevant and Appropriate	Establishes benchmark approach for setting clean-up levels for radionuclides.	†
	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR Part 192)	Relevant and Appropriate	Establishes concentration limits for clean-up of Ra-226, Ra-228 and thorium in soil.	†
	Use of Soil Clean-up Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites, Directive No. 9200.4-25, February 12, 1998.	To be Considered	Addresses use of soil clean-up criteria in 40 CFR 192 in setting remediation levels for subsurface soil at CERCLA sites with radioactive contamination.	†
	Remediation Goals for Radioactively-Contaminated CERCLA Site Using the Benchmark Dose Clean-Up Criteria in 10 CFR 40, Appendix A, I, Criterion 6(6), Directive No. 9200-4-35P, April 11, 2000.	To be Considered	Addresses the use of the soil and structure clean-up criteria in 10 CFR 40, Appendix A, I, Criterion 6(6) with setting remediation goals at CERCLA sites with radioactive contamination.	†
	Federal RCRA Subtitle C (40 CFR Part 264 Subpart G - Closure and Post Closure, Sections 264.111, 264.114, and 264.117)	Relevant and Appropriate	Establishes performance standards for closure of hazardous waste landfills and groundwater monitoring.	*
Groundwater	Federal Ambient Water Quality Criteria (AWQC) (CWA 303)	Relevant and Applicable	Federal AWQC are health-based criteria which have been developed for certain carcinogenic and noncarcinogenic compounds.	**
	Federal RCRA Subtitle C Regulations, 40 CFR Part 264 Subpart F - Releases from Solid Waste Management Units, Sections 264.95, 264.96(a) and (c), 264.97, 264.98 and 264.99)	Relevant and Appropriate	Groundwater monitoring requirements and compliance points for determining the need for additional monitoring and corrective action.	* **

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Substantive landfill closure requirements that address clean closure will be met by this alternative.

** These criteria will be used to determine if other activities minimize the contribution of contaminants from the site to surface water.

† Excavation and offsite disposal will be conducted in accordance with these requirements.

Table 1F
Alternative SC-3A - Excavation/Off-Site Disposal (Recreational User)
Potential Radiological-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements
STATE REGULATORY REQUIREMENTS			
Soil / Groundwater	Massachusetts Regulations for Control of Radiation (105 CMR 120)	Relevant and Appropriate	Establishes standards for radiation related activities.
FEDERAL REGULATORY REQUIREMENTS			
Air	National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Clean Air Act (40 CFR 61, Subparts H and I)	Relevant and Appropriate	Provides guidance on air emissions of radionuclides during cleanup of Federal Facilities and licensed NRC facilities with radioactive contamination.
Groundwater	Ore Mining and Dressing Point Source Category (40 CFR 440, Subpart C)	Relevant and Appropriate	Regulates effluent limits from facilities that extract / process uranium, radium and vanadium ores. May be applicable to discharges of radioactive waste to surface waters.
	Federal Water Quality Criteria (FWQC) and State Water Quality Standards (Water Quality Criteria, Report of the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1986)	To be considered	FWQC are criteria / standards for the protection of aquatic life and / or human health.
	Health and Environmental Protection for Uranium and Thorium Tailings (40 CFR 192, Subpart A, Table 1)	Relevant and Appropriate	Standards have been developed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for sites that are exempt from CERCLA for radium / thorium in soil.
	Federal Safe Drinking Water Act - Maximum Contaminant Levels (MCLs) for Radiological Constituents (40 CFR 141 Subparts B, G and I)	Applicable, if non-zero	MCLs have been promulgated for a number of radiological constituents. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered appropriate for groundwater aquifers potentially used for drinking water.
Soil	Health and Environmental Protection for Uranium and Thorium Tailings (40 CFR 192.12, 192.32, 192.41)	Relevant and Appropriate	Standards have been developed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for sites that are exempt from CERCLA for radium / thorium in soil.
	Licensing Requirements for Land Disposal of Radioactive Waste (10 CFR 61.41)	Relevant and Appropriate	Provides performance objectives for licensed disposal sites containing low level radioactive waste if the waste will be left permanently on site.

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

See chemical-, action-, and location-specific ARAR tables for a discussion of how the radiological-specific ARARs are addressed, if at all, by this alternative.

Table 1G
Alternative SC-3B - Excavation/Off-Site Disposal (Adjacent Resident Without Groundwater Consumption)
Potential Chemical-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Soil / Groundwater	Massachusetts Regulations for Control of Radiation (105 CMR 120)	Relevant and Appropriate	Establishes standards for radiation related activities.	*
FEDERAL REGULATORY REQUIREMENTS				
Non-Environmental Materials	Department of the Army, USACE EM-385-1-80, Table 6-4	To be Considered	This USACE Radiation Protection Manual table sets acceptable surface contamination levels for U-nat, U-235, U-238 and associated decay products for release of equipment and non-environmental materials (e.g., old kitchen appliances).	*
Soil	Domestic Licensing of Source Material (10 CFR 40, Appendix A, I Criterion 6(6))	Relevant and Appropriate	Establishes benchmark approach for setting clean-up levels for radionuclides.	*
	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR Part 192)	Relevant and Appropriate	Establishes concentration limits for clean-up of Ra-226, Ra-228 and thorium in soil.	*
	Use of Soil Clean-up Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites, Directive No. 9200.4-25, February 12, 1998.	To be Considered	Addresses use of soil clean-up criteria in 40 CFR 192 in setting remediation levels for subsurface soil at CERCLA sites with radioactive contamination.	*
	Remediation Goals for Radioactively-Contaminated CERCLA Site Using the Benchmark Dose Clean-Up Criteria in 10 CFR 40, Appendix A, I, Criterion 6(6), Directive No. 9200-4-35P, April 11, 2000.	To be Considered	Addresses the use of the soil and structure clean-up criteria in 10 CFR 40, Appendix A, I, Criterion 6(6) with setting remediation goals at CERCLA sites with radioactive contamination.	*
Sediment	Ontario Ministry of the Environment Sediment Quality Guidelines	To be Considered	The Sediment Quality Guidelines present scientific data and guidance on the environmental effects of pollutants. The criteria can contribute to establishing requirements that govern impacts to sediment quality.	*

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Will be met through excavation and off-site disposal of radiological and chemical waste.

Table 1G
Alternative SC-3B - Excavation/Off-Site Disposal (Adjacent Resident Without Groundwater Consumption)
Potential Location-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Wetland Sediment	Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00)	Applicable	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling altering or polluting inland wetlands. This requirement regulates work within the wetlands buffer zone, and defines wetlands based on vegetation type and mitigation requirements.	***
	401 Water Quality Certification for Discharge of Dredged or Fill Material (314 CMR 9.00)	Applicable	ARAR if discharge of dredged or fill material occurs.	***
	Massachusetts Endangered Species Act (321 CMR 10.00)	Applicable	Requires that site activities be conducted in a manner that minimizes impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	**
FEDERAL REGULATORY REQUIREMENTS				
Wetland Sediment	Federal Executive Order on Protection of Wetlands (E.O. 11990, 40 CFR Part 6, Appendix A)	Applicable	Requires federal agencies to avoid impacts associated with the destruction or loss of wetlands, minimize potential harm, preserve and enhance wetlands, and avoid support of new construction in wetlands if a practicable alternative exists.	*
	Federal Fish and Wildlife Coordination Act (16 USC 661 et. seq., 40 CFR Part 6)	Applicable	Establishes requirements for a consultation with U.S. Fish and Wildlife Service and state wildlife agencies to mitigate losses of fish and wildlife that result from modification of a water body.	****
	Federal Clean Water Act (33 USC 1344), US Army Corps of Engineers Nationwide Permit Program (33 CFR Part 330), "Federal Guidelines for Specification of Disposal Sites" (40 CFR Part 230), Clean Water Act Sections 401 and 404 (33 CFR 26)	Applicable	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative that has less effect is available. The requirements also describe actions to minimize adverse impacts. Establishes regulations for filling and dredging within wetlands.	*
	Endangered Species Act (50 CFR Parts 17.11-12)	Applicable	Requires site action be conducted in a manner that avoids harming threatened or endangered species or their habitat.	**

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Because high levels of contamination exist in wetlands area, there is no practical alternative to excavating wetlands areas. Actions will be taken to minimize impacts to the maximum extent practical.

** Should threatened, protected or endangered species be encountered, the requirements of these regulations will be met.

*** Because excavation is required in the wetlands/buffer zone, all substantive requirements of these regulations will be met.

**** Should this alternative require modification of a water body, this consultation requirement will be conducted.

Table 1G
Alternative SC-3B - Excavation/Off-Site Disposal (Adjacent Resident Without Groundwater Consumption)
Potential Action-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Air	Massachusetts DEP Air Pollution Control Regulations (310 CMR 7.00)	Applicable	These regulations set requirements for fugitive emissions, dust, and particulates.	*
Non-Environmental Materials	Department of the Army, USACE EM-385-1-80, Table 6-4	To be Considered	This USACE Radiation Protection Manual table sets acceptable surface contamination levels for U-nat, U-235, U-238 and associated decay products for release of equipment and non-environmental materials (e.g., old kitchen appliances).	†
Soil	Domestic Licensing of Source Material (10 CFR 40, Appendix A, I Criterion 6(6))	Relevant and Appropriate	Establishes benchmark approach for setting clean-up levels for radionuclides.	†
	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR Part 192)	Relevant and Appropriate	Establishes concentration limits for clean-up of Ra-226, Ra-228 and thorium in soil.	†
	Use of Soil Clean-up Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites, Directive No. 9200.4-25, February 12, 1998.	To be Considered	Addresses use of soil clean-up criteria in 40 CFR 192 in setting remediation levels for subsurface soil at CERCLA sites with radioactive contamination.	†
	Remediation Goals for Radioactively-Contaminated CERCLA Site Using the Benchmark Dose Clean-Up Criteria in 10 CFR 40, Appendix A, I, Criterion 6(6), Directive No. 9200-4-35P, April 11, 2000.	To be Considered	Addresses the use of the soil and structure clean-up criteria in 10 CFR 40, Appendix A, I, Criterion 6(6) with setting remediation goals at CERCLA sites with radioactive contamination.	†
	Massachusetts DEP Hazardous Waste Regulations (310 CMR 30.000)	Relevant and Appropriate	These regulations describe the requirements for treatment, storage, and disposal of hazardous waste.	**
FEDERAL REGULATORY REQUIREMENTS				
Air	National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Clean Air Act (40 CFR 61, Subparts H and I)	Relevant and Appropriate	Regulates air emissions of VOCs and radionuclides.	*

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Excavation activities will be conducted to meet the requirements of these regulations.

** Substantive landfill closure requirements that address clean closure will be met by this alternative.

† Excavation and offsite disposal will be conducted in accordance with these requirements.

Table 1G
Alternative SC-3B - Excavation/Off-Site Disposal (Adjacent Resident Without Groundwater Consumption)
Potential Action-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
FEDERAL REGULATORY REQUIREMENTS				
Soil	Federal RCRA Subtitle C (40 CFR Part 264 Subpart G - Closure and Post Closure, Sections 264.111, 264.114, and 264.117)	Relevant and Appropriate	Establishes performance standards for closure of hazardous waste landfills and groundwater monitoring.	*
Groundwater	Federal Ambient Water Quality Criteria (AWQC) (CWA 303)	Relevant and Applicable	Federal AWQC are health-based criteria which have been developed for certain carcinogenic and noncarcinogenic compounds.	**
	Federal RCRA Subtitle C Regulations, 40 CFR Part 264 Subpart F - Releases from Solid Waste Management Units, Sections 264.95, 264.96(a) and (c), 264.97, 264.98 and 264.99)	Relevant and Appropriate	Groundwater monitoring requirements and compliance points for determining the need for additional monitoring and corrective action.	* ****

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Substantive landfill closure requirements that address clean closure will be met by this alternative.

** These criteria will be used to determine if other activities minimize the contribution of contaminants from the site to surface water.

Table 1G
Alternative SC-3B - Excavation/Off-Site Disposal (Adjacent Resident Without Groundwater Consumption)
Potential Radiological-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements
STATE REGULATORY REQUIREMENTS			
Soil / Groundwater	Massachusetts Regulations for Control of Radiation (105 CMR 120)	Relevant and Appropriate	Establishes standards for radiation related activities.
FEDERAL REGULATORY REQUIREMENTS			
Air	National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Clean Air Act (40 CFR 61, Subparts H and I)	Relevant and Appropriate	Provides guidance on air emissions of radionuclides during cleanup of Federal Facilities and licensed NRC facilities with radioactive contamination.
Groundwater	Ore Mining and Dressing Point Source Category (40 CFR 440, Subpart C)	Relevant and Appropriate	Regulates effluent limits from facilities that extract / process uranium, radium and vanadium ores. May be applicable to discharges of radioactive waste to surface waters.
	Federal Water Quality Criteria (FWQC) and State Water Quality Standards (Water Quality Criteria, Report of the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1986)	To be considered	FWQC are criteria / standards for the protection of aquatic life and / or human health.
	Health and Environmental Protection for Uranium and Thorium Tailings (40 CFR 192, Subpart A, Table 1)	Relevant and Appropriate	Standards have been developed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for sites that are exempt from CERCLA for radium / thorium in soil.
	Federal Safe Drinking Water Act - Maximum Contaminant Levels (MCLs) for Radiological Constituents (40 CFR 141 Subparts B, G and I)	Applicable, if non-zero	MCLs have been promulgated for a number of radiological constituents. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered appropriate for groundwater aquifers potentially used for drinking water.
Soil	Health and Environmental Protection for Uranium and Thorium Tailings (40 CFR 192.12, 192.32, 192.41)	Relevant and Appropriate	Standards have been developed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for sites that are exempt from CERCLA for radium / thorium in soil.
	Licensing Requirements for Land Disposal of Radioactive Waste (10 CFR 61.41)	Relevant and Appropriate	Provides performance objectives for licensed disposal sites containing low level radioactive waste if the waste will be left permanently on site.

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

See chemical-, action-, and location-specific ARAR tables for a discussion of how the radiological-specific ARARs are addressed, if at all, by this alternative.

Table 1H
Alternative SC-3C Excavation/Off-Site Disposal (Adjacent Resident with Groundwater)
Potential Chemical-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Soil / Groundwater	Massachusetts Regulations for Control of Radiation (105 CMR 120)	Relevant and Appropriate	Establishes standards for radiation related activities.	*
Groundwater	Massachusetts Department of Environmental Protection (DEP) Drinking Water Standards 310 CMR 22.00 (March, 1997) and	Relevant and Appropriate	Maximum Contaminant Limits regulate the concentration of contaminants in public drinking water supplies.	**
	Massachusetts Groundwater Quality Standards (314 CMR 6.00)	Relevant and Appropriate	These standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected, and set forth water quality criteria necessary to	**
FEDERAL REGULATORY REQUIREMENTS				
Non-Environmental	Department of the Army, USACE EM-385-1-80, Table 6-4	To be Considered	This USACE Radiation Protection Manual table sets acceptable surface contamination levels for U-nat, U-235, U-238 and associated decay products for release of equipment and	*
Soil	Domestic Licensing of Source Material (10 CFR 40, Appendix A, I Criterion 6(6))	Relevant and Appropriate	Establishes benchmark approach for setting clean-up levels for radionuclides.	*
	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR Part 192)	Relevant and Appropriate	Establishes concentration limits for clean-up of Ra-226, Ra-228 and thorium in soil.	*
	Use of Soil Clean-up Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites, Directive No. 9200.4-25,	To be Considered	Addresses use of soil clean-up criteria in 40 CFR 192 in setting remediation levels for subsurface soil at CERCLA sites with radioactive contamination.	*
	Remediation Goals for Radioactively-Contaminated CERCLA Site Using the Benchmark Dose Clean-Up Criteria in 10 CFR 40, Appendix A, I, Criterion 6(6), Directive No. 9200-4-35P, April 11, 2000.	To be Considered	Addresses the use of the soil and structure clean-up criteria in 10 CFR 40, Appendix A, I, Criterion 6(6) with setting remediation goals at CERCLA sites with radioactive contamination.	*
Groundwater	Federal Safe Drinking Water Act - Maximum Contaminated Levels (MCLs) for Organic and Inorganic Chemicals (40 CFR 141 Subparts B, G and I)	Relevant and Appropriate	Promulgates MCLs for a number of common organic and inorganic chemicals and action levels for lead and copper. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered appropriate for groundwater aquifers potentially used for drinking water.	**
	Federal Safe Drinking Water Act - non-zero Maximum Contaminant Level Goals (MCLGs) for Organic and Inorganic Chemicals (40 CFR 141 Subpart F)	Relevant and Appropriate	Establishes MCLGs for organic and inorganic contaminants. MCLGs that are non-zero will be relevant and appropriate.	**
	USEPA Reference Doses (RfDs) and EPA Carcinogen Assessment Group Potency Factors	To be Considered	RfD is an estimate of a daily oral exposure to human population that is likely to be without an appreciable risk of noncancer effects. The Cancer Group Potency Factors are used as a qualitative weight-of-evidence judgement to the likelihood of a chemical being a carcinogen.	**
	USEPA Health Advisories	To be Considered	Health Advisory is an estimate of acceptable drinking water levels for a chemical based on health effects.	**
Sediment	Ontario Ministry of the Environment Sediment Quality Guidelines	To be Considered	The Sediment Quality Guidelines present scientific data and guidance on the environmental effects of pollutants. The criteria can contribute to establishing requirements that govern impacts to sediment quality.	*

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Will be met through excavation and off-site disposal of radiological and chemical wastes.

** Will not be met due to presence of off-site source.

Table 1H
Alternative SC-3C - Excavation/Off-Site Disposal (Adjacent Resident with Groundwater Consumption)
Potential Location-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Wetland Sediment	Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00)	Applicable	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling altering or polluting inland wetlands. This requirement regulates work within the wetlands buffer zone, and defines wetlands based on vegetation type and mitigation requirements.	***
	401 Water Quality Certification for Discharge of Dredged or Fill Material (314 CMR 9.00)	Applicable	ARAR if discharge of dredged or fill material occurs.	***
	Massachusetts Endangered Species Act (321 CMR 10.00)	Applicable	Requires that site activities be conducted in a manner that minimizes impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	**
FEDERAL REGULATORY REQUIREMENTS				
Wetland Sediment	Federal Executive Order on Protection of Wetlands (E.O. 11990, 40 CFR Part 6, Appendix A)	Applicable	Requires federal agencies to avoid impacts associated with the destruction or loss of wetlands, minimize potential harm, preserve and enhance wetlands, and avoid support of new construction in wetlands if a practicable alternative exists.	*
	Federal Fish and Wildlife Coordination Act (16 USC 661 et. seq., 40 CFR Part 6)	Applicable	Establishes requirements for a consultation with U.S. Fish and Wildlife Service and state wildlife agencies to mitigate losses of fish and wildlife that result from modification of a water body.	****
	Federal Clean Water Act (33 USC 1344), US Army Corps of Engineers Nationwide Permit Program (33 CFR Part 330), "Federal Guidelines for Specification of Disposal Sites" (40 CFR Part 230), Clean Water Act Sections 401 and 404 (33 CFR 26)	Applicable	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative that has less effect is available. The requirements also describe actions to minimize adverse impacts. Establishes regulations for filling and dredging within wetlands.	*
	Endangered Species Act (50 CFR Parts 17.11-12)	Applicable	Requires site action be conducted in a manner that avoids harming threatened or endangered species or their habitat.	**

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Because high levels of contamination exist in wetlands area, there is no practical alternative to excavating wetlands areas. Actions will be taken to minimize impacts to the maximum extent practical.

** Should threatened, protected or endangered species be encountered, the requirements of these regulations will be met.

*** Because excavation is required in the wetlands/buffer zone, all substantive requirements of these regulations will be met.

**** Should this alternative require modification of a water body, this consultation requirement will be conducted.

Table 1H
Alternative SC-3C - Excavation/Off-Site Disposal (Adjacent Resident with Groundwater Consumption)
Potential Action-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Air	Massachusetts DEP Air Pollution Control Regulations (310 CMR 7.00)	Applicable	These regulations set requirements for fugitive emissions, dust, and particulates.	*
Non-Environmental Materials	Department of the Army, USACE EM-385-1-80, Table 6-4	To be Considered	This USACE Radiation Protection Manual table sets acceptable surface contamination levels for U-nat, U-235, U-238 and associated decay products for release of equipment and non-environmental materials (e.g., old kitchen appliances).	†
Soil	Domestic Licensing of Source Material (10 CFR 40, Appendix A, I Criterion 6(6))	Relevant and Appropriate	Establishes benchmark approach for setting clean-up levels for radionuclides.	†
	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR Part 192)	Relevant and Appropriate	Establishes concentration limits for clean-up of Ra-226, Ra-228 and thorium in soil.	†
	Use of Soil Clean-up Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites, Directive No. 9200.4-25, February 12, 1998.	To be Considered	Addresses use of soil clean-up criteria in 40 CFR 192 in setting remediation levels for subsurface soil at CERCLA sites with radioactive contamination.	†
	Remediation Goals for Radioactively-Contaminated CERCLA Site Using the Benchmark Dose Clean-Up Criteria in 10 CFR 40, Appendix A, I, Criterion 6(6), Directive No. 9200-4-35P, April 11, 2000.	To be Considered	Addresses the use of the soil and structure clean-up criteria in 10 CFR 40, Appendix A, I, Criterion 6(6) with setting remediation goals at CERCLA sites with radioactive contamination.	†
	Massachusetts DEP Hazardous Waste Regulations (310 CMR 30.000)	Relevant and Appropriate	These regulations describe the requirements for treatment, storage, and disposal of hazardous waste.	**
FEDERAL REGULATORY REQUIREMENTS				
Air	National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Clean Air Act (40 CFR 61, Subparts H and I)	Relevant and Appropriate	Regulates air emissions of VOCs and radionuclides.	*

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Excavation activities will be conducted to meet the requirements of these regulations.

** Substantive landfill closure requirements that address clean closure will be met by this alternative.

† Excavation and offsite disposal will be conducted in accordance with these requirements.

Table 1H
Alternative SC-3C Excavation/Off-Site Disposal (Adjacent Resident with Groundwater)
Potential Action-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
FEDERAL REGULATORY REQUIREMENTS				
Soil	Federal RCRA Subtitle C (40 CFR Part 264 Subpart G - Closure and Post Closure, Sections 264.111, 264.114, and 264.117)	Relevant and Appropriate	Establishes performance standards for closure of hazardous waste landfills and groundwater monitoring.	*
Groundwater	Federal Ambient Water Quality Criteria (AWQC) (CWA 303)	Relevant and Applicable	Federal AWQC are health-based criteria which have been developed for certain carcinogenic and noncarcinogenic compounds.	**
	Federal RCRA Subtitle C Regulations, 40 CFR Part 264 Subpart F - Releases from Solid Waste Management Units, Sections 264.95, 264.96(a) and (c), 264.97, 264.98 and 264.99)	Relevant and Appropriate	Groundwater monitoring requirements and compliance points for determining the need for additional monitoring and corrective action.	* ****

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Substantive landfill closure requirements that address clean closure will be met by this alternative.

** These criteria will be used to determine if other activities minimize the contribution of contaminants from the site to surface water.

Table 1H
Alternative SC-3C - Excavation/Off-Site Disposal (Adjacent Resident with Groundwater Consumption)
Potential Radiological-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements
STATE REGULATORY REQUIREMENTS			
Soil / Groundwater	Massachusetts Regulations for Control of Radiation (105 CMR 120)	Relevant and Appropriate	Establishes standards for radiation related activities.
FEDERAL REGULATORY REQUIREMENTS			
Air	National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Clean Air Act (40 CFR 61, Subparts H and I)	Relevant and Appropriate	Provides guidance on air emissions of radionuclides during cleanup of Federal Facilities and licensed NRC facilities with radioactive contamination.
Groundwater	Ore Mining and Dressing Point Source Category (40 CFR 440, Subpart C)	Relevant and Appropriate	Regulates effluent limits from facilities that extract / process uranium, radium and vanadium ores. May be applicable to discharges of radioactive waste to surface waters.
	Federal Water Quality Criteria (FWQC) and State Water Quality Standards (Water Quality Criteria, Report of the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1986)	To be considered	FWQC are criteria / standards for the protection of aquatic life and / or human health.
	Health and Environmental Protection for Uranium and Thorium Tailings (40 CFR 192, Subpart A, Table 1)	Relevant and Appropriate	Standards have been developed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for sites that are exempt from CERCLA for radium / thorium in soil.
	Federal Safe Drinking Water Act - Maximum Contaminant Levels (MCLs) for Radiological Constituents (40 CFR 141 Subparts B, G and I)	Applicable, if non-zero	MCLs have been promulgated for a number of radiological constituents. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered appropriate for groundwater aquifers potentially used for drinking water.
Soil	Health and Environmental Protection for Uranium and Thorium Tailings (40 CFR 192.12, 192.32, 192.41)	Relevant and Appropriate	Standards have been developed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for sites that are exempt from CERCLA for radium / thorium in soil.
	Licensing Requirements for Land Disposal of Radioactive Waste (10 CFR 61.41)	Relevant and Appropriate	Provides performance objectives for licensed disposal sites containing low level radioactive waste if the waste will be left permanently on site.

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

See chemical-, action-, and location-specific ARAR tables for a discussion of how the radiological-specific ARARs are addressed, if at all, by this alternative.

Table 1I
Alternative SC-3D - Excavation/Off-Site Disposal (On-Site Resident)
Potential Chemical-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Soil / Groundwater	Massachusetts Regulations for Control of Radiation (105 CMR 120)	Relevant and Appropriate	Establishes standards for radiation related activities.	*
Groundwater	Massachusetts Department of Environmental Protection (DEP) Drinking Water Standards 310 CMR 22.00 (March, 1997) and Addendum (June, 1999)	Relevant and Appropriate if groundwater remains designated as drinking water / potential drinking water source	Maximum Contaminant Limits regulate the concentration of contaminants in public drinking water supplies.	**
	Massachusetts Groundwater Quality Standards (314 CMR 6.00)	Relevant and Appropriate if groundwater remains designated as drinking water / potential drinking water source	These standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected, and set forth water quality criteria necessary to maintain the designated areas. GW-3 and GW-1 groundwater standards apply to the site.	**
FEDERAL REGULATORY REQUIREMENTS				
Non-Environmental Materials	Department of the Army, USACE EM-385-1-80, Table 6-4	To be Considered	This USACE Radiation Protection Manual table sets acceptable surface contamination levels for U-nat, U-235, U-238 and associated decay products for release of equipment and non-environmental materials (e.g., old kitchen appliances).	*
Soil	Domestic Licensing of Source Material (10 CFR 40, Appendix A, I Criterion 6(6))	Relevant and Appropriate	Establishes benchmark approach for setting clean-up levels for radionuclides.	*
	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR Part 192)	Relevant and Appropriate	Establishes concentration limits for clean-up of Ra-226, Ra-228 and thorium in soil.	*
	Use of Soil Clean-up Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites, Directive No. 9200.4-25, February 12, 1998.	To be Considered	Addresses use of soil clean-up criteria in 40 CFR 192 in setting remediation levels for subsurface soil at CERCLA sites with radioactive contamination.	*
	Remediation Goals for Radioactively-Contaminated CERCLA Site Using the Benchmark Dose Clean-Up Criteria in 10 CFR 40, Appendix A, I, Criterion 6(6), Directive No. 9200-4-35P, April 11, 2000.	To be Considered	Addresses the use of the soil and structure clean-up criteria in 10 CFR 40, Appendix A, I, Criterion 6(6) with setting remediation goals at CERCLA sites with radioactive contamination.	*
Groundwater	Federal Safe Drinking Water Act - Maximum Contaminated Levels (MCLs) for Organic and Inorganic Chemicals (40 CFR 141 Subparts B, G and I)	Relevant and Appropriate if groundwater remains designated as drinking water / potential drinking water source	Promulgates MCLs for a number of common organic and inorganic chemicals and action levels for lead and copper. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered appropriate for groundwater aquifers potentially used for drinking water.	**
	Federal Safe Drinking Water Act - non-zero Maximum Contaminant Level Goals (MCLGs) for Organic and Inorganic Chemicals (40 CFR 141 Subpart F)	Relevant and Appropriate if groundwater remains designated as drinking water / potential drinking water source	Establishes MCLGs for organic and inorganic contaminants. MCLGs that are non-zero will be relevant and appropriate.	**
	USEPA Reference Doses (RfDs) and EPA Carcinogen Assessment Group Potency Factors	To Be Considered	RfD is an estimate of a daily oral exposure to human population that is likely to be without an appreciable risk of noncancer effects. The Cancer Group Potency Factors are used as a qualitative weight-of-evidence judgement to the likelihood of a chemical being a carcinogen.	**
	USEPA Health Advisories	To Be Considered	Health Advisory is an estimate of acceptable drinking water levels for a chemical based on health effects.	**
Sediment	Ontario Ministry of the Environment Sediment Quality Guidelines	To Be Considered	The Sediment Quality Guidelines present scientific data and guidance on the environmental effects of pollutants. The criteria can contribute to establishing requirements that govern impacts to sediment quality.	*

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Will be met through excavation and off-site disposal of radiological and chemical contaminants.

** Will not be met due to presence of off-site source.

Table 1I
Alternative SC-3D - Excavation/Off-Site Disposal (On-Site Resident)
Potential Location-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Wetland Sediment	Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00)	Applicable	These regulations are promulgated under Wetlands Protection Laws, which regulate dredging, filling altering or polluting inland wetlands. This requirement regulates work within the wetlands buffer zone, and defines wetlands based on vegetation type and mitigation requirements.	***
	401 Water Quality Certification for Discharge of Dredged or Fill Material (314 CMR 9.00)	Applicable	ARAR if discharge of dredged or fill material occurs.	***
	Massachusetts Endangered Species Act (321 CMR 10.00)	Applicable	Requires that site activities be conducted in a manner that minimizes impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	**
FEDERAL REGULATORY REQUIREMENTS				
Wetland Sediment	Federal Executive Order on Protection of Wetlands (E.O. 11990, 40 CFR Part 6, Appendix A)	Applicable	Requires federal agencies to avoid impacts associated with the destruction or loss of wetlands, minimize potential harm, preserve and enhance wetlands, and avoid support of new construction in wetlands if a practicable alternative exists.	*
	Federal Fish and Wildlife Coordination Act (16 USC 661 et. seq., 40 CFR Part 6)	Applicable	Establishes requirements for a consultation with U.S. Fish and Wildlife Service and state wildlife agencies to mitigate losses of fish and wildlife that result from modification of a water body.	****
	Federal Clean Water Act (33 USC 1344), US Army Corps of Engineers Nationwide Permit Program (33 CFR Part 330), "Federal Guidelines for Specification of Disposal Sites" (40 CFR Part 230), Clean Water Act Sections 401 and 404 (33 CFR 26)	Applicable	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative that has less effect is available. The requirements also describe actions to minimize adverse impacts. Establishes regulations for filling and dredging within wetlands.	*
	Endangered Species Act (50 CFR Parts 17.11-12)	Applicable	Requires site action be conducted in a manner that avoids harming threatened or endangered species or their habitat.	**

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Because high levels of contamination exist in wetlands area, there is no practical alternative to excavating wetlands areas. Actions will be taken to minimize impacts to the maximum extent practical.

** Should threatened, protected or endangered species be encountered, the requirements of these regulations will be met.

*** Because excavation is required in the wetlands / buffer zone, all substantive requirements of these regulations will be met.

**** Should this alternative require modification of a water body, this consultation requirement will be conducted.

Table 1I
Alternative SC-3D - Excavation/Off-Site Disposal (On-Site Resident)
Potential Action-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
STATE REGULATORY REQUIREMENTS				
Air	Massachusetts DEP Air Pollution Control Regulations (310 CMR 7.00)	Applicable	These regulations set requirements for fugitive emissions, dust, and particulates.	*
Non-Environmental Materials	Department of the Army, USACE EM-385-1-80, Table 6-4	To be Considered	This USACE Radiation Protection Manual table sets acceptable surface contamination levels for U-nat, U-235, U-238 and associated decay products for release of equipment and non-environmental materials (e.g., old kitchen appliances).	†
Soil	Domestic Licensing of Source Material (10 CFR 40, Appendix A, I Criterion 6(6))	Relevant and Appropriate	Establishes benchmark approach for setting clean-up levels for radionuclides.	†
	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR Part 192)	Relevant and Appropriate	Establishes concentration limits for clean-up of Ra-226, Ra-228 and thorium in soil.	†
	Use of Soil Clean-up Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites, Directive No. 9200.4-25, February 12, 1998.	To be Considered	Addresses use of soil clean-up criteria in 40 CFR 192 in setting remediation levels for subsurface soil at CERCLA sites with radioactive contamination.	†
	Remediation Goals for Radioactively-Contaminated CERCLA Site Using the Benchmark Dose Clean-Up Criteria in 10 CFR 40, Appendix A, I, Criterion 6(6), Directive No. 9200-4-35P, April 11, 2000.	To be Considered	Addresses the use of the soil and structure clean-up criteria in 10 CFR 40, Appendix A, I, Criterion 6(6) with setting remediation goals at CERCLA sites with radioactive contamination.	†
	Massachusetts DEP Hazardous Waste Regulations (310 CMR 30.000)	Relevant and Appropriate	These regulations describe the requirements for treatment, storage, and disposal of hazardous waste.	**
FEDERAL REGULATORY REQUIREMENTS				
Air	National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Clean Air Act (40 CFR 61, Subparts H and I)	Relevant and Appropriate	Regulates air emissions of VOCs and radionuclides.	*

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Excavation activities will be conducted to meet the requirements of these regulations.

** Substantive landfill closure requirements that address clean closure will be met by this alternative.

† Excavation and offsite disposal will be conducted in accordance with these requirements.

Table 1I
Alternative SC-3D - Excavation/Off-Site Disposal (On-Site Resident)
Potential Action-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements	Meet or Attain ARAR
FEDERAL REGULATORY REQUIREMENTS				
Soil	Federal RCRA Subtitle C (40 CFR Part 264 Subpart G - Closure and Post Closure, Sections 264.111, 264.114, and 264.117)	Relevant and Appropriate	Establishes performance standards for closure of hazardous waste landfills and groundwater monitoring.	*
Groundwater	Federal Ambient Water Quality Criteria (AWQC) (CWA 303)	Relevant and Applicable	Federal AWQC are health-based criteria which have been developed for certain carcinogenic and noncarcinogenic compounds.	**
	Federal RCRA Subtitle C Regulations, 40 CFR Part 264 Subpart F - Releases from Solid Waste Management Units, Sections 264.95, 264.96(a) and (c), 264.97, 264.98 and 264.99)	Relevant and Appropriate	Groundwater monitoring requirements and compliance points for determining the need for additional monitoring and corrective action.	* ****

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

* Substantive landfill closure requirements that address clean closure will be met by this alternative.

** These criteria will be used to determine if other activities minimize the contribution of contaminants from the site to surface water.

Table 1I
Alternative SC-3D - Excavation/Off-Site Disposal (On-Site Resident)
Potential Radiological-Specific ARARs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Medium	Requirements	Status	Synopsis of Requirements
STATE REGULATORY REQUIREMENTS			
Soil / Groundwater	Massachusetts Regulations for Control of Radiation (105 CMR 120)	Relevant and Appropriate	Establishes standards for radiation related activities.
FEDERAL REGULATORY REQUIREMENTS			
Air	National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Clean Air Act (40 CFR 61, Subparts H and I)	Relevant and Appropriate	Provides guidance on air emissions of radionuclides during cleanup of Federal Facilities and licensed NRC facilities with radioactive contamination.
Groundwater	Ore Mining and Dressing Point Source Category (40 CFR 440, Subpart C)	Relevant and Appropriate	Regulates effluent limits from facilities that extract / process uranium, radium and vanadium ores. May be applicable to discharges of radioactive waste to surface waters.
	Federal Water Quality Criteria (FWQC) and State Water Quality Standards (Water Quality Criteria, Report of the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1986)	To be considered	FWQC are criteria / standards for the protection of aquatic life and / or human health.
	Health and Environmental Protection for Uranium and Thorium Tailings (40 CFR 192, Subpart A, Table 1)	Relevant and Appropriate	Standards have been developed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for sites that are exempt from CERCLA for radium / thorium in soil.
	Federal Safe Drinking Water Act - Maximum Contaminant Levels (MCLs) for Radiological Constituents (40 CFR 141 Subparts B, G and I)	Applicable, if non-zero	MCLs have been promulgated for a number of radiological constituents. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered appropriate for groundwater aquifers potentially used for drinking water.
Soil	Health and Environmental Protection for Uranium and Thorium Tailings (40 CFR 192.12, 192.32, 192.41)	Relevant and Appropriate	Standards have been developed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for sites that are exempt from CERCLA for radium / thorium in soil.
	Licensing Requirements for Land Disposal of Radioactive Waste (10 CFR 61.41)	Relevant and Appropriate	Provides performance objectives for licensed disposal sites containing low level radioactive waste if the waste will be left permanently on site.

Notes:

Applicable - Addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site.

Relevant and Appropriate - Not directly applicable to the site, but addresses situations similar enough to be relevant and appropriate.

To be considered - Non-promulgated Federal or State criteria, advisories or guidance do not have ARAR status; however, they may be considered in determining cleanup levels protective of public health or the environment.

See chemical-, action-, and location-specific ARAR tables for a discussion of how the radiological-specific ARARs are addressed, if at all, by this alternative.

Table 2
Summary of Remedial Action Objectives and General Response Actions
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Media	Remedial Action Objectives	General Response Action
Source Control	For Human Health Prevent ingestion / direct contact with soil having non-carcinogens in excess of a Hazard Index (HI) greater than 1 or with soil having carcinogens posing excess cancer risk above 10^{-4} to 10^{-6} and meet ARARs. Prevent inhalation of carcinogens posing excess cancer risk levels above 10^{-4} to 10^{-6} and meet ARARs.	*Institutional Controls* Access Restrictions Fencing / Signs *Containment/Consolidation* Capping *Excavation/Disposal* In-situ / Ex-situ Treatment On-site / Off-site Disposal
Management of Migration	For Human Health Prevent ingestion of groundwater having carcinogens in excess of MCLs, non-zero MCLGs, and a total excess cancer risk for all contaminants in groundwater greater than 10^{-4} to 10^{-6}. Prevent ingestion of groundwater having non-carcinogens in excess of MCLs or non-zero MCLGs.	*Institutional Controls* Alternative Water Supply Monitoring *Collection/Treatment* In-situ treatment Collection / Ex-situ treatment
Sediment	For Human Health Prevent exposure to sediment having carcinogens posing excess cancer risk above 10^{-4} to 10^{-6}. For Environmental Protection Prevent exposure to contaminants from sediments that cause an unacceptable risk to the environment.	*Institutional Controls* Access Restrictions *Containment/Consolidation* Capping *Excavation/Disposal* In-situ / Ex-situ Treatment On-site / Off-site Disposal
Surface Water	Prevent migration of contamination from site to surface water to reduce to the extent practicable the contribution of contamination from the site to surface waters.	*See General Response Actions in other media*

Notes:
RAOs and GRAs were prepared in accordance with USEPA OWSER "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA." October 1988.
MCL - Maximum Contaminant Limits
MCLGs - Maximum Contaminant Limit Guidelines

Table 3A
Preliminary Remediation Goals
Groundwater, Surface Water, Sediment
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

COPCs	Non-Cancer Risk-Based PRGs Hazard Index = 1	Cancer Risk-Based PRGs ELCR = 1E-06	Cancer Risk-Based PRGs ELCR = 1E-05	ARAR	Chemical Site PRGs
Groundwater-Chemical (ug/L)					
Arsenic	-	-	-	1.0E+01	1.0E+01
Barium	-	-	-	2.0E+03	2.0E+03
Benzene	-	-	-	5.0E+00	5.0E+00
Benzo(b)fluoranthene	-	7.8E-02	7.8E-01	-	7.8E-01
Beryllium	-	-	-	4.0E+00	4.0E+00
Cadmium	-	-	-	5.0E+00	5.0E+00
Chromium	-	-	-	1.0E+02	1.0E+02
cis-1,2-dichloroethene	-	-	-	7.0E+01	7.0E+01
Manganese	2.5E+02	-	-	-	2.5E+02
Nickel	2.1E+02	-	-	-	2.1E+02
Trichloroethene	-	-	-	5.0E+00	5.0E+00
Vinyl chloride	-	-	-	2.0E+00	2.0E+00
Zinc	3.1E+03	-	-	-	3.1E+03
Groundwater-Radiological (pCi/L)					
U-234	-	-	-	1.9E+05	1.9E+05
U-238	-	-	-	9.9E+00	9.9E+00
U-235	-	-	-	6.6E+01	6.6E+01
Surface Water (ug/L)					
Aroclor-1254	-	3.3E-02	3.3E-01	-	3.3E-01
Benzo(a)pyrene	-	2.9E-03	2.9E-02	-	2.9E-02
Benzo(b)fluoranthene	-	2.9E-02	2.9E-01	-	2.9E-01
Benzo(k)fluoranthene	-	9.6E-02	9.6E-01	-	9.6E-01
Beryllium	7.0E+01	-	-	-	7.0E+01
Chromium	1.9E+02	-	-	-	1.9E+02
Nickel	4.0E+04	-	-	-	4.0E+04
Sediment (mg/kg)					
Aroclor-1254	5.0E+00	-	-	-	5.0E+00

Notes:

ARAR - Applicable or Relevant and Appropriate Requirement
COPC - Contaminant of Potential Concern
ELCR - Excess Lifetime Cancer Risk
MCP - Massachusetts Contingency Plan
PRG - Preliminary Remediation Goal

COPC list established from Baseline Human Health Risk Assessment Interim Deliverable #3 Review Draft, November 2003.

Groundwater chemical ARARs are USEPA Maximum Contaminant Levels (MCLs).

Site PRG based on the risk-based PRG or ARAR when available.
When both risk-based and ARAR-based PRGs are available for a given analyte, the site PRG is the lower of the two values.

Table 3B
Preliminary Remediation Goals
Recreational User
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

COPCs	Non-Cancer Risk-Based PRGs Hazard Index = 1	Cancer Risk-Based PRGs ELCR = 1E-06	Cancer Risk-Based PRGs ELCR = 1E-05	ARAR	Chemical and Radiological Site PRGs
Soil-Chemical (mg/kg)					
Arsenic	-	1.7E+00	1.7E+01	-	1.7E+01
Benzo(a)anthracene	-	2.8E+00	2.8E+01	-	2.8E+01
Benzo(a)pyrene	-	2.8E-01	2.8E+00	-	2.8E+00
Benzo(b)fluoranthene	-	2.8E+00	2.8E+01	-	2.8E+01
Dibenz(a,h)anthracene	-	2.8E-01	2.8E+00	-	2.8E+00
Dioxins TEQ	-	1.7E-05	1.7E-04	-	1.7E-04
Lead	-		-	-	1.4E+03
Nickel	7.0E+03	-	-	-	7.0E+03
Total - Uranium	1.1E+03	-	-	-	1.1E+03
Soil-Radiological (pCi/g)					
Ra-226	-	4.0E-01	4.0E+00	5.0E+00	4.0E+00
U-234	-	2.3E+01	2.3E+02	-	2.3E+02
U-235	-	5.2E+00	5.2E+01	-	5.2E+01
U-238	-	1.1E+01	1.1E+02	-	1.1E+02

Notes:

ARAR - Applicable or Relevant and Appropriate Requirement
COPC - Contaminant of Potential Concern
ELCR - Excess Lifetime Cancer Risk
MCP - Massachusetts Contingency Plan
PRG - Preliminary Remediation Goal

COPC list established from Baseline Human Health Risk Assessment Interim Deliverable #3 Review Draft, November 2003.
Cancer and non-cancer PRGs are based on: Future young child / adult recreational user RME with ingestion and dermal exposure to soil (User lives away from the site and visits the site for recreational purposes)

ARAR for Radium-226 in soil based on UMTRCA guidance of 5 pCi / g.
Lead PRG is based on blood level modeling for an adult exposure.
USEPA ResRad modeling indicates that use of 1E-05 ELCR complies with the MA DPH dose-based ARAR for unrestricted site release (10 mrem / yr) (April 2004).
The cumulative risk associated with an 1E-05 ELCR equals 1E-04.

Site PRG based on the lowest value of the risk-based PRG or ARAR when available.

Table 3C
Preliminary Remediation Goals
Adjacent Resident
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

COPCs	Non-Cancer Risk-Based PRGs Hazard Index = 1	Cancer Risk-Based PRGs ELCR = 1E-06	Cancer Risk-Based PRGs ELCR = 1E-05	ARAR	Chemical Site PRGs	Radiological Site PRGs Without GW	Radiological Site PRGs With GW
Soil-Chemical (mg/kg)							
Arsenic	6.8E+01	1.2E+00	1.2E+01	-	1.2E+01		
Benzo(a)anthracene	-	2.8E+00	2.8E+01	-	2.8E+01		
Benzo(a)pyrene	-	2.8E-01	2.8E+00	-	2.8E+00		
Benzo(b)fluoranthene	-	2.8E+00	2.8E+01	-	2.8E+01		
Dibenz(a,h)anthracene	-	2.8E-01	2.8E+00	-	2.8E+00		
Dioxins TEQ	-	1.7E-05	1.7E-04	-	1.7E-04		
Lead	-	-	-	-	1.4E+03		
Nickel	7.0E+03	-	-	-	7.0E+03		
Total - Uranium	1.1E+03	-	-	-	1.1E+03		
Soil-Radiological (pCi/g)							
Ra-226	-	3.1E-01	3.1E+00	5.0E+00		3.1E+00	8.2E-01
U-234	-	2.2E+01	2.2E+02	-		2.2E+02	2.2E+01
U-235	-	5.2E+00	5.2E+01	-		5.2E+01	5.2E+00
U-238	-	1.1E+01	1.1E+02	-		1.1E+02	1.1E+01

Notes:

ARAR - Applicable or Relevant and Appropriate Requirement
COPC - Contaminant of Potential Concern
ELCR - Excess Lifetime Cancer Risk
MCP - Massachusetts Contingency Plan
PRG - Preliminary Remediation Goal

COPC list based on Baseline Human Health Risk Assessment Interim Deliverable #3 Review Draft, November 2003.
Cancer and non-cancer PRGs are based on: Future young child / adult recreational user living adjacent to the site with ingestion and dermal exposure to soil (RME)
(User receives 50% of dose from residence COPCs and 50% of dose from site COPCs)

ARAR for Radium-226 in soil based on UMTRCA guidance of 5 pCi / g.
Lead PRG is based on blood level modeling for an adult exposure.
USEPA ResRad modeling indicates ELCR of 1E-05 complies with the MA DPH dose-based ARAR for unrestricted site release (10 mrem / year) WITHOUT groundwater consumption (April 2004).
USEPA ResRad modeling indicates ELCR of 1E-06 complies with the MA DPH dose-based ARAR for unrestricted site release (10 mrem / year) WITH groundwater consumption (April 2004).
The cumulative risk associated with an 1E-05 ELCR is less than 1E-04 (is approximately 9.3E-05).

Site PRG based on the lowest value of the risk-based PRG or ARAR when available.
If the selected site PRG for Ra-226 is less than background, then the site PRG is background.
Background for Ra-226 is defined as the mean concentration plus two standard deviations (0.64 + (2*0.09) pCi / g) (Table 1, ORNL Radiation Survey, 1981)

Table 3D
Preliminary Remediation Goals
Onsite Resident
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

COPCs	Non-Cancer Risk-Based PRGs Hazard Index = 1	Cancer Risk-Based PRGs ELCR = 1E-06	Cancer Risk-Based PRGs ELCR = 1E-05	ARAR	ResRad Dose-based ARAR Without GW	ResRad Dose-based ARAR With GW	Chemical and Radiological Site PRGs Without or Without GW
Soil-Chemical (mg/kg)							
Arsenic	-	9.1E-01	9.1E+00	-	-	-	9.1E+00
Benzo(a)anthracene	-	1.4E+00	1.4E+01	-	-	-	1.4E+01
Benzo(a)pyrene	-	1.4E-01	1.4E+00	-	-	-	1.4E+00
Benzo(b)fluoranthene	-	1.4E+00	1.4E+01	-	-	-	1.4E+01
Benzo(k)fluoranthene	-	1.4E+01	1.4E+02	-	-	-	1.4E+02
Chromium	5.5E+02	-	-	-	-	-	5.5E+02
Dibenz(a,h)anthracene	-	1.4E-01	1.4E+00	-	-	-	1.4E+00
Dioxins TEQ	-	9.1E-06	9.1E-05	-	-	-	9.1E-05
Indeno(1,2,3-cd)pyrene	-	1.4E+00	1.4E+01	-	-	-	1.4E+01
Lead	-	-	-	-	-	-	5.6E+02
Mercury	1.8E+01	-	-	-	-	-	1.8E+01
Nickel	3.7E+03	-	-	-	-	-	3.7E+03
Total - Uranium	5.5E+02	-	-	-	-	-	5.5E+02
Soil-Radiological (pCi/g)							
Ra-226	-	2.7E-02	2.7E-01	5.0E+00	1.9E+00	1.1E+00	8.2E-01
U-234	-	1.2E+01	1.2E+02	-	-	-	1.2E+01
U-235	-	4.2E-01	4.2E+00	-	-	-	4.2E-01
U-238	-	1.7E+00	1.7E+01	-	-	-	1.7E+00

Notes:

ARAR - Applicable or Relevant and Appropriate Requirement
COPC - Contaminant of Potential Concern
ELCR - Excess Lifetime Cancer Risk
MCP - Massachusetts Contingency Plan
PRG - Preliminary Remediation Goal

COPC list based on Baseline Human Health Risk Assessment Interim Deliverable #3 Review Draft, November 2003.
Cancer and non-cancer PRGs are based on: Young child / adult resident user RME with ingestion / dermal exposure to soil (User receives 100% dose from site COPCs)

ARAR for Radium-226 in soil based on UMTRCA guidance of 5 pCi / g.
Lead PRG is based on blood level modeling for a child exposure.
USEPA ResRad modeling for uranium indicates ELCR of 1E-05 complies with the MA DPH dose-based ARAR for unrestricted site release (10 mrem / year) WITHOUT groundwater consumption (April 2004).
USEPA ResRad modeling for uranium indicates ELCR of 1E-06 complies with the MA DPH dose-based ARAR for unrestricted site release (10 mrem / year) WITH groundwater consumption (April 2004).
USEPA ResRad modeling for radium-226 indicates 1.9 pCi / g would be compliant with the MA DPH dose-based ARAR for unrestricted use (10 mrem / yr) WITHOUT groundwater consumption (April 2004).
USEPA ResRad modeling for radium-226 indicates 0.27 pCi / g *ABOVE BACKGROUND* (0.82 pCi / g) would be compliant with the MA DPH ARAR for unrestricted use (10 mrem / yr) WITH groundwater consumption (April 2004).

Site PRGs for the radiological COPCs are selected using an ELCR of 1E-06.
Site PRGs for the chemical COPCs are selected using an ELCR of 1E-05.
The cumulative risk for the chemical COPCs (1E-05 ELCR) is less than 1E-04 (is approximately 8.6E-05).

Site PRG based on the lowest value of the risk-based PRG or ARAR when available.
If the selected site PRG for Ra-226 is less than background, then the site PRG is background.
Background for Ra-226 is defined as the mean concentration plus two standard deviations (0.64 + (2*0.09) pCi / g) (Table 1, ORNL Radiation Survey, 1981)

Table 4
Summary of Process Option Screening - Source Control
Feasibility Study
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

General Response Action	Remedial Technology	Process Option	Description	Ability to address organics	Ability to address inorganics	Ability to address radionuclides	Screening Comments	Carry forward for site soil?	Carry forward for residential soil?	Carry forward for site sediment?
No Action/Institutional Controls:										
No action	None	None	No Action	Not applicable	Not applicable	Not applicable	Required for consideration under National Contingency Plan.	Yes	Yes	Yes
Access Restrictions	Access Restrictions	Deed restrictions	Restrict future site usage to minimize contact with soils.	Not applicable	Not applicable	Not applicable	Potentially applicable.	Yes	Yes	Yes
		Fencing / Signs	Maintain site boundary fence to limit access; post signage noting trespassers not allowed.	Not applicable	Not applicable	Not applicable	Potentially applicable.	Yes	Yes	Yes
Containment:	***Containment Technologies:***									
Containment	Capping	Soil cover	Approximately 3' of soil; no gas collection, allows for drainage, evapotranspiration.	Good	Good	Good	Does not keep water from infiltrating cover.	Yes	Yes	Yes
		Single-Layer Cap	Single layer (usually clay); no gas collection or drainage layer.	Good	Good	Good	Not feasible for addressing vapors and moisture generated under cap.	No	No	No
		Multiple-Layer Cap	Gas collection and drainage layers used in conjunction with barrier layer.	Good	Good	Good	Addresses drainage and vapor issues.	Yes	Yes	Yes
		Alternate Materials Cap	Use geomembranes, capillary barriers, evapotranspiration barriers, or asphalt as cover.	Good	Good	Good	Addresses drainage and vapor issues.	Yes	Yes	Yes
	Barrier Wall	Sheet piling	Drive steel sheets into the ground to keep soils from migrating past boundary.	Good	Good	Good	Does not address onsite risks; difficult to maintain.	No	No	No
		Chemical grout injection	Hydraulically inject a physical barrier of chemical grout to prevent soil migration.	Good	Good	Good	Does not address onsite risks; difficult to maintain.	No	No	No
Excavation/Treatment/Disposal:	***Removal Technologies:***									
On-site / Off-site Disposal	Excavation	Excavation	Physically remove soil for either offsite disposal or ex-situ treatment.	Good	Good	Good	Potentially applicable.	Yes	Yes	Yes
	Disposal Options:									
	On-site disposal	Landfill	Consolidate materials onsite; use in conjunction with an on-site treatment technology.	Good	Good	Good	Potentially applicable.	Yes	Yes	Yes
	Off-site disposal	Landfill	Transport materials to landfill able to accept contaminants of concern.	Good	Good	Good	Potentially applicable.	Yes	Yes	Yes
In-situ / Ex-situ Treatment	*In-Situ Treatment Options:*									
	Solidification / Stabilization	In-situ vitrification	Use in-situ electrodes to create very high temperatures that crystallize soil.	Good	Good	Good	Difficult to apply for unsaturated soils at or near the surface.	No	No	No
	Thermal treatment	Steam injection	Inject steam into the subsurface to increase temperature and vaporize organic contaminants.	Good	Poor	Poor	Not a proven technology for inorganics and radionuclides	No	No	No
		Radio frequency / Electric resistance	Increase subsurface temperature by using electromagnetic energy.	Good	Poor	Poor	Not a proven technology for inorganics and radionuclides	No	No	No
		Electrokinetic separation	Use polarized electrodes to migrate and capture ionized contaminants.	Average	Good	Average	Difficult to apply for unsaturated soils at or near the surface.	No	No	No
	Ex-Situ Treatment Options:									
	Volume reduction	Physical screening	Separate contaminated soil using screens or scanners to decrease soil volume to treat.	Average	Average	Average	Potentially applicable.	No	No	No
		Solvent extraction	Use organic solvents to extract contaminants from soil to decrease soil volume to treat.	Good	Good	Average	Potentially applicable.	Yes	Yes	Yes
		Soil washing	Use water-based solutions to "scrub" contaminants from soil.	Good	Good	Good	Potentially applicable.	Yes	Yes	Yes
	Solidification / Stabilization	Vitrification	Use ex-situ electrodes to create very high temperatures to crystallize soil.	Good	Good	Good	Potentially applicable; may be difficult to apply for unsaturated soils at or near the surface.	Yes	Yes	Yes
		Soluable phosphates	Add phosphates to soil to form complex, immobile metals.	Poor	Good	Average	Potentially applicable.	Yes	Yes	Yes
		Pozzolan / Portland, sulfur cement	Mix cement with soil to solidify and immoblize contaminants.	Good	Good	Good	Potentially applicable.	Yes	Yes	Yes
		Polyethylene extrusion	Mix binder material with soil to solidify and immoblize contaminants.	Good	Good	Good	Little full-scale implementation documentation available.	No	No	No
	Thermal treatment	Incineration	Combust organic materials using oxygen.	Good	Poor	Poor	Not a proven technology for inorganics and radionuclides	No	No	No
		Thermal desorption	Decompose contaminants in an oxygen-free atmosphere.	Good	Poor	Poor	Not a proven technology for inorganics and radionuclides	No	No	No

References:
Federal Remediation Technologies Roundtable. http://www.frtr.gov/matrix2/section3/table3_2.html
Interstate Technology Regulatory Council. "Technology Overview Using Case Studies of Alternative Landfill Technologies and Associated Regulatory Topics". March 2003.
United States Environmental Protection Agency. "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA." October 1988.
United States Environmental Protection Agency. "Reach It." http://www.epareachit.org"

Table 5
Summary of Process Option Cost, Effectiveness, and Implementability Screening - Source Control
Feasibility Study
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

GRA	Remedial Technology	Process Option	Effectiveness	Implementability	Cost	Eliminate	Maintain
No Action/ Institutional Controls	No Action	None	Does not achieve remdial action objectives.	Not acceptable to local / public government.	None.		X
	Access Restrictions	Deed restrictions	Depends on continued implementation; does not reduce site contamination.	Need to meet legal requirements.	Minimal.		X
		Fencing / Signs	Does not reduce site contamination.	Easy to install; need to agree on site boundary.	Low capital, low maintenance.		X
Containment:	Capping	Soil cover	Effective; water infiltration a potential concern.	Easy to implement; land restrictions required.	Moderate capital; moderate maintenance.	X	
		Multi-Barrier cap	Effective; surface water runoff a potential concern.	Easy to implement; land restrictions required.	High capital; moderate maintenance.		X
		Alternate Materials cap	Effective; surface water runoff a potential concern.	Easy to implement; land restrictions required.	High capital; moderate maintenance.	X	
Excavation/Treatment/ Disposal	Removal	Excavation	Effective and reliable.	Easy to implement; need to define limits of excavation.	High capital and disposal costs; low O&M.		X
	On-site / Off-site Disposal	Landfill	Effective and reliable.	Transportation to landfill requires permit and coordination.	High capital and disposal costs; no O&M.		X
	Ex-Situ Volume reduction	Solvent extraction	Moderately reliable.	Difficult to implement.	High capital; no O&M.	X	
		Soil washing	Effective.	Moderate to implement.	High capital; no O&M.	X	
	Ex-Situ Solidification / Stabilization	Vitrification	Ineffective at meeting ARARs	Moderate to implement.	High capital; low O&M.	X	
		Soluable phosphates	Ineffective at meeting ARARs	Moderate to implement.	High capital; low O&M.	X	
		Pozzolan / Portland, sulfur cement	Ineffective at meeting ARARs	Moderate to implement.	High capital; low O&M.	X	

Notes:
Cost, effectiveness, and implementability evaluation performed in accordance with USEPA OWSER "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA." October 1988.

Table 6
Summary of Soil Volumes Exceeding PRGs
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

	Units	Onsite Resident With or Without GW Consumption	Adjacent Resident With GW Consumption	Adjacent Resident Without GW Consumption	Recreational User
MAIN FENCELINE (EXCLUDING TONGUE AREA)					
Chemical Impacts Only	yd^3	11,482	11,482	11,482	11,482
Radiological Impacts Only	yd^3	57,647	54,059	10,046	8,452
Ecological Risk	yd^3	699	1,109	2,455	2,895
Total soil volume within Main Fenceline	yd^3	69,128	65,540	21,528	19,933
TONGUE AREA					
Chemical Impacts Only	yd^3	10,046	10,046	10,046	10,046
Radiological Impacts Only	yd^3	3,349	3,349	0	0
Total soil volume within Tongue Area	yd^3	13,395	13,395	10,046	10,046
OTHER LOCATIONS OUTSIDE FENCELINES					
Chemical Impacts Only	yd^3	4,306	2,870	2,870	2,870
Radiological Impacts Only	yd^4	3,030	3,030	0	0
Ecological Risk (Inner Rung)	yd^3	2,222	2,222	2,222	2,222
Total soil volume outside fenceline	yd^3	9,558	8,122	5,093	5,093
TOTAL VOLUMES					
Chemical Impacts Only	yd^3	25,833	24,398	24,398	24,398
Radiological Impacts Only	yd^3	64,025	60,437	10,046	8,452
Ecological Risk	yd^3	2,921	3,331	4,677	5,117
Total soil volume - all areas	**yd^3**	**92,780**	**88,167**	**39,122**	**37,967**

Notes:
PRG - Preliminary Remediation Goal
yd - yard
Soil volumes exceeding radiological COPCs calculated using a 20m x 20m area.
Soil volumes exceeding chemical COPCs calculated using a 30m x 30m area.
Radiological waste is assumed to be mixed waste.

Table 7
Detailed Analysis: Alternative SC-1 - No Action
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Detailed Analysis Criteria	Alternative SC-1 - No Action
1. Overall Protection of Human Health & the Environment	
Human Health Protection	The results of the baseline human health risk assessment indicate there is unacceptable potential future risk to human health at the site from the chemical and radiological waste in the soil, sediment and groundwater. In addition, the human health risk assessment indicates a current risk exists from manganese in groundwater that is used as drinking water. Because this alternate does not require any action to be taken, this alternative does not provide any overall protection to human health from these risks.
Ecological Protection	The results of the baseline ecological risk assessment indicate there is unacceptable potential risk to ecological receptors from the soil and sediment at the site. Because this alternative does not require any action to be taken, this alternative does not provide any overall protection to ecological receptors from these risks.
2. Compliance With ARARs	
Chemical-specific ARARs	This alternative would not comply with chemical-specific ARARs.
Action-specific ARARs	Because there are no actions required by this alternative, there are no action-specific ARARs.
Location-specific ARARs	Because there are no actions required by this alternative, there are no location-specific ARARs.
Other criteria, advisories and guidances	No other criteria, advisories, or guidances have been identified for this alternative.
3. Long-Term Effectiveness & Permanence	
Magnitude of residual risk	The magnitude of residual risk under this alternative is very high because all waste material that presents an unacceptable risk remains at the site in the long-term.
Adequacy and reliability of controls	The adequacy and reliability of controls is very low because this alternative does not provide for any activities or controls, thereby affording no effectiveness in the long-term or permanence.
4. Reduction of Toxicity, Mobility & Volume Through Treatment	
Treatment process used and materials treated	Under this alternative, there are no treatment processes proposed, and no media would be treated.
Amount of hazardous materials removed or treated	Under this alternative, no hazardous materials would be removed or treated.
Degree of expected reductions in toxicity, mobility and volume	Under this alternative, very minimal reductions in toxicity, mobility and volume would occur through natural degradation pathways.
Degree to which treatment is reversible	No treatment is proposed under this alternative, so reversibility is not relevant.
Type and quantity of residuals remaining after treatment	No treatment is proposed under this alternative, so site conditions would remain unchanged.

Table 7
Detailed Analysis: Alternative SC-1 - No Action
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Detailed Analysis Criteria	Alternative SC-1 - No Action
5. Short-Term Effectiveness	
Protection of community during remedial actions	This alternative does not present any short-term risks or impacts to the community because no construction activities take place.
Protection of workers during remedial actions	This alternative does not present any short-term risks or impacts to workers because no construction activities take place.
Environmental impacts	No remedial action is proposed under this alternative, so there would be no associated environmental impacts.
Time until remedial action objectives are achieved	Because this alternative does not actively address the risk at the site, remedial action objectives would take hundreds of years to achieve.
6. Implementability	
Ability to construct and operate the technology	No use of technology is proposed under this alternative, so there is no requirement for construction and operation.
Reliability of the technology	No use of technology is proposed under this alternative, so there is no consideration of reliability.
Ease of undertaking additional remedial actions, if necessary	Additional remedial action could be undertaken if necessary, as none are proposed under this alternative.
Ability to monitor effectiveness of remedy	Monitoring can be used to assess the degree and rate to which natural degradation is occurring.
Ability to obtain approvals from other agencies	Because this alternative does not require any activity to take place, approvals are not required.
Coordination with other agencies	Because this alternative does not require any activity to take place, no further agency coordination would be required.
Availability of off-site treatment, storage and disposal services and capacity	Off-site treatment, storage and disposal services would not be required under this alternative.
Availability of prospective technologies	No technologies are required to implement this alternative.
7. Cost	
Capital cost	$0
Present worth of O&M cost (30 years)	$0
Total estimated cost	$0

Source Control Cost Estimate: Alternative SC-1 - No Action
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	***No. of Units***	***Units***	***Unit Cost ($)***	***Cost ($)***
A. Construction Cost				
There is no construction cost associated with this alternative.				
				-
B. Annual Operations, Maintenance, & Management Costs				
There are no operations, maintenance, and management costs associated with this alternative.				
				-
C. Present Worth				
Number of Years of O&M	-			
				-
TOTAL COST				-

Table 9
Detailed Analysis: Alternative SC-2 - Multi-Barrier Cap/Excavation of Radiological Material
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Detailed Analysis Criteria	Alternative SC-2 - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
1. Overall Protection of Human Health & the Environment	
Human Health Protection	The results of the baseline human health risk assessment indicate there is a current human helath risk from manganese in the groundwater and a potential future risk to human health at the site from soil, sediment and groundwater. This alternative will protect human health by eliminating exposure to soil and sediment thru either excavation and off-site disposal or consolidation and capping depending upon the material. In addition, exposure to contaminated groundwater will be addressesd by connecting two residences to public water.
Ecological Protection	The results of the baseline ecological risk assessment indicate there is potential risk to ecological receptors from sediment and soil at the site. This alternative would protect ecological health either by excavation and off-site disposal and / or capping of waste materials that present an unaccpetable risk. This would also minimize migration of contaminants from the site to surface water to the maximum extent practicable.
2. Compliance With ARARs	
Chemical-specific ARARs	Under this alternative, chemical-specific ARARs would be met, with the exception of Alternatives SC-2C and SC-2D where groundwater remains a drinking water source. See Tables 1B through 1E for Alternatives SC-2A, SC-2B, SC-2C, and SC-2D ARARs.
Action-specific ARARs	Under this alternative, action-specific ARARs would be met. See Tables 1B through 1E for Alternatives SC2-A, SC2-B, SC2-C, and SC2-D ARARs.
Location-specific ARARs	Under this alternative, location-specific ARARs would be met. See Tables 1B through 1E for Alternatives SC2-A, SC2-B, SC2-C, and SC2-D ARARs.
Other criteria, advisories and guidances	Site activities would consider all other criteria, advisories or guidance identified in Tables 1B through 1E for Alternatives SC2-A, SC2-B, SC2-C, and SC2-D ARARs.
3. Long-Term Effectiveness & Permanence	
Magnitude of residual risk	The residual risks that will remain will be small in that all soil and sediment that exceed cleanup levels will be addressed by either excavation and off-site disposal or consolidation and capping. Because waste exceeding cleanup levels will remain on-site beneath the cap, the cap must be regularly inspected and maintained to minimize risk in the future. Current groundwater risk will be addressed by connecting two residences to public water. It is anticipated that groundwater may have a "low use and value" in the future and will, therefore, no longer be considered a drinking water source. If that is the case, than the magnitude of the residual risk would be low.
Adequacy and reliability of controls	Excavation, capping and two public water connections are all reliable remedial technologies. Regular inspection and maintenance of the cap system is required as well as possible groundwater monitoring.

Table 9
Detailed Analysis: Alternative SC-2 - Multi-Barrier Cap/Excavation of Radiological Material
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Detailed Analysis Criteria	Alternative SC-2 - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
4. Reduction of Toxicity, Mobility & Volume Through Treatment	
Treatment process used and materials treated	Materials that are excavated and disposed of off -site maybe treated prior to disposal depending upon legal requirements.
Amount of hazardous materials removed or treated	Depending upon the exposure scenario proposed, different quantities of waste materials will be excavated and removed from the Site for off-site disposal.
Degree of expected reductions in toxicity, mobility and volume	Excavation would permanently remove radiation contaminated waste from the Site thereby reducing the volume at the site. The cap would reduce the mobility of contaminants by eliminating infiltration.
Degree to which treatment is reversible	Some materials disposed of off-site may require treatment prior to disposal--this treatment would be irreversible.
Type and quantity of residuals remaining after treatment	After excavation, waste material exceeding chemical cleanup levels will be consolidated and capped on-site depending on the risk scenario, this volume of material will vary. Because waste exceeding cleanup levels will remain on-site beneath the cap, the cap must be regularly inspected and maintained to minimize risk in the future. Current groundwater risk will be addressed by connecting two residences to public water. Because groundwater is not being addressed other than by connecting two residences to public water, contaminants would remain in groundwater. It is anticipated that groundwater may have a low use and value in the future and no longer be considered a drinking water source. If that is the case, residual groundwater contamination will remain, but will not present a risk.
5. Short-Term Effectiveness	
Protection of community during remedial actions	Excavation and construction activities would be completed in accordance with all required health and safety regulations and procedures. A traffic control plan would be implemented to address increased truck traffic in the area to minimize risk to the community. Site perimeter air, noise, and dust monitoring would be conducted to verify that site work is conducted in a manner that is safe for the community.
Protection of workers during remedial actions	Excavation and construction activities would be completed in accordance with required health and safety regulations and procedures. Site workers would don appropriate PPE during site work. Air monitoring and engineering controls would be instituted to assess and minimize worker exposure.
Environmental impacts	An endangered species survey would be conducted prior to site work and appropriate measures taken to address legal requirements related to endangered species. Because this alternative requires excavation in wetland areas, actions will be taken to minimize impacts to the extent practicable. Wetlands would be restored / replicated in the eastern portion of the Site.
Time until remedial action objectives are achieved	Depending on the selected risk scenario, this alternative can be completed between approximately 18 and 25 months.

Table 9
Detailed Analysis: Alternative SC-2 - Multi-Barrier Cap/Excavation of Radiological Material
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Detailed Analysis Criteria	Alternative SC-2 - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
6. Implementability	
Ability to construct and operate the technology	It is possible to complete excavation, two residential water connections, and capping at the site. The most difficult part of the construction would be to stabilize the area with fill prior to building the cap.
Reliability of the technology	Excavation, two public water connections and capping are standard, reliable technologies with a proven history of successful construction at similar sites.
Ease of undertaking additional remedial actions, if necessary	Additional excavation can always be conducted at a later date. However, once the cap is constructed, areas within the cap footprint would not be easily accessible for future remediation, and newly excavated materials would have to disposed of off-site.
Ability to monitor effectiveness of remedy	Post-excavation confirmatory samples would determine whether an area has been successfully remediated to acceptable cleanup levels. The cap system would be monitored to assess the cap integrity, vegetative cover, and drainage systems.
Ability to obtain approvals from other agencies	These are standard waste disposal technologies with clear regulatory requirements. Because the capping activity will take place on-site, no additional approvals are needed. In accordance with CERCLA, the two public water connections will not require a permit. Waste materials that are sent off-site for disposal will be sent to licensed waste disposal facilities so addtional approvals should be minimal, if required at all.
Coordination with other agencies	Coordination would be required with the MADEP, USACE, various departments within the Towns of Norton and Attleboro, and National Grid.
Availability of off-site treatment, storage and disposal services and capacity	Facilities are available to accept the sources area material proposed to be excavated and disposed of off-site.
Availability of necessary equipment and specialists	The personnel, materials, and equipment required to implement this alternative are readily available.
Availability of prospective technologies	Excavation, two public water connections and capping have been completed at similar sites.
7. Cost	
Capital cost	SC-2A – Recreational user – $22,640,000 SC-2B – Adjacent Resident without GW exposure – $24,689,000 SC-2C – Adjacent Resident with GW exposure – $91,079,000 SC-2D – Onsite Resident – $95,631,000
Present worth of O&M cost (30 years)	SC-2A – Recreational user – $3,417,000 SC-2B – Adjacent Resident without GW exposure – $3,417,000 SC-2C – Adjacent Resident with GW exposure – $3,435,000 SC-2D – Onsite Resident – $3,425,000
Total estimated cost	SC-2A – Recreational user – $26,057,000 SC-2B – Adjacent Resident without GW exposure – $28,106,000 SC-2C – Adjacent Resident with GW exposure – $94,514,000 SC-2D – Onsite Resident – $99,066,000

Table 10A
Alternative SC-2A - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
Recreational User
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*		*Unit Cost ($)*		*Cost ($)*
A. Construction Cost						
Permitting						
Wetlands / landfill / construction coordination	1	lump sum	$	25,000	$	25,000
Deed restriction	1	lump sum	$	10,000	$	10,000
				Subtotal	$	35,000
Site Preparation and General Equipment						
Survey equipment	18	month	$	2,000	$	36,000
Temporary office trailers (2)	36	month	$	500	$	18,000
Temporary storage box	18	month	$	80	$	1,440
Temporary utilities	18	month	$	1,000	$	18,000
Office equipment	1	lump sum	$	10,000	$	10,000
Parking / access roads	300	square yard	$	7	$	1,950
Security system	1	lump sum	$	2,500	$	2,500
Rental toilets	36	month	$	150	$	5,400
Silt fence	5,000	linear foot	$	1	$	3,750
Structural / residential survey	1	lump sum	$	2,500	$	2,500
Signage	7	each	$	150	$	1,050
Endangered species survey	1	lump sum	$	2,500	$	2,500
Air monitoring	18	month	$	1,250	$	22,500
Dust monitoring	18	month	$	900	$	16,200
PPE / safety supplies	18	month	$	2,500	$	45,000
Decon supplies	18	month	$	1,000	$	18,000
Radiation monitoring	18	month	$	2,000	$	36,000
Equipment / trailer mob / demob	3	lump sum	$	3,000	$	9,000
Contractor mobilization	1	lump sum	$	40,000	$	40,000
Excavator rental	36	month	$	7,500	$	270,000
Dozer rental	36	month	$	5,000	$	180,000
Front end loader rental	36	month	$	7,500	$	270,000
Dump truck rental	36	month	$	5,000	$	180,000
Water truck rental	18	month	$	3,000	$	54,000
Site vehicles / gas	18	month	$	7,500	$	135,000
				Subtotal	$	1,378,790
Dewatering						
Pumps and lay-flat hoses	8	month	$	5,000	$	40,000
Water treatment / stormwater management	8	month	$	75,000	$	600,000
				Subtotal	$	640,000
PCB and Dioxins Consolidation and Offsite Disposal						
Disposal characterization analysis	7	each	$	500	$	3,500
Debris disposal	500	cubic yard	$	200	$	100,000
Gondola / transport	2,900	cubic yard	$	300	$	870,000
Disposal at facility	2,900	cubic yard	$	500	$	1,450,000
Confirmatory analysis	38	each	$	300	$	11,400
				Subtotal	$	2,434,900

Table 10A
Alternative SC-2A - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
Recreational User
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*	*Unit Cost ($)*	*Cost ($)*
Radiological Consolidation and Offsite Disposal				
Disposal characterization analysis	20	each	$ 500	$ 10,000
Debris disposal	500	cubic yard	$ 200	$ 100,000
Gondola / transport	8,452	cubic yard	$ 300	$ 2,535,600
Disposal at facility	8,452	cubic yard	$ 500	$ 4,226,000
Confirmatory analysis	58	each	$ 300	$ 17,400
			Subtotal	$ 6,889,000
Consolidation - Tongue Area (No Offsite Disposal)				
Confirmatory analysis	32	each	$ 300	$ 9,600
Backfill	9,317	cubic yard	$ 9	$ 83,849
Backfill analysis	12	each	$ 500	$ 6,000
			Subtotal	$ 99,449
Consolidation - Inner Rung (No Offsite Disposal)				
Confirmatory analysis	50	each	$ 300	$ 15,000
Backfill	2,222	cubic yard	$ 9	$ 19,998
Backfill analysis	3	each	$ 500	$ 1,500
Wetland restoration	0.7	acre	$ 75,000	$ 52,500
			Subtotal	$ 88,998
Consolidation - Wetlands Replication Area (No Offsite Disposal)				
Confirmatory analysis	64	each	$ 300	$ 19,200
Backfill	2,895	cubic yard	$ 9	$ 26,055
Backfill analysis	3	each	$ 500	$ 1,500
Wetland restoration	3.2	acre	$ 75,000	$ 240,000
			Subtotal	$ 286,755
Cap Materials				
Clearing and grubbing - entire site	9.3	acre	$ 1,000	$ 9,250
Common / structural fill (for grading)	5,000	cubic yard	$ 9	$ 45,000
12" soil gas venting layer	8,809	cubic yard	$ 23	$ 202,602
Gas collection piping	1,600	linear foot	$ 8	$ 12,000
Passive Gas Vent Risers	10	linear foot	$ 150	$ 1,500
Geosynthetic clay liner	237,838	square foot	$ 0.58	$ 137,946
40 mil VLDPE flexible membrane liner	237,838	square foot	$ 0.42	$ 99,892
12 " drainage layer (granular soil)	8,809	cubic yard	$ 23	$ 202,602
4" dia. PE drainage tubing (cover drain)	2,000	linear foot	$ 8	$ 15,000
Protective soil	9,300	cubic yard	$ 9	$ 83,700
Topsoil	4,404	cubic yard	$ 17	$ 74,875
Hydroseeding	8,809	square yard	$ 0.50	$ 4,404
Erosion control mat	237,838	square foot	$ 0.32	$ 76,108
Drainage swales	2,700	linear foot	$ 3	$ 6,750
24' Gate	2	each	$ 2,000	$ 4,000
Chain link fence	2,900	linear foot	$ 12	$ 34,800
Retention pond	1	lump sum	$ 20,000	$ 20,000
Monitoring well installation	20	each	$ 1,000	$ 20,000
			Subtotal	$ 1,050,430

Table 10A
Alternative SC-2A - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
Recreational User
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*	*Unit Cost ($)*	*Cost ($)*
Install Public Waterline				
Coordination with stakeholders	1	ls	$ 12,000	$12,000
Residential connections	2	ea	$ 6,000	$12,000
New connection permit	2	ls	$ 3,300	$6,600
Tapping, materials, and road repair	2	ea	$ 2,500	$5,000
Abandon existing wells / plumb new connections	2	ea	$ 5,000	$10,000
Extend 10" water main	4,000	foot	$ 110	$440,000
Fire hydrant installation	2	ea	$ 10,000	$20,000
Extend waterline under railroad tracks	1	ls	$ 125,000	$125,000
			Subtotal	$630,600
Replace / Raise high-voltage transmission lines and towers				$ 1,000,000
Contractor labor (15%)				$ 2,024,838
Design (10%)				$ 1,349,892
Engineering and construction oversight (15%)				$ 2,024,838
Contingency (20%)				$ 2,706,784
			Subtotal	$ 9,106,353
			Subtotal Construction Costs	$ 22,640,000
B. Annual Operation, Maintenance, & Monitoring Cost				
Cover mowing	2	each	$ 3,000	$ 6,000
Cover erosion and subsidence repair	1	lump sum	$ 4,000	$ 4,000
Cap Inspection				
Inspection	12	day	$ 1,000	$ 12,000
Travel and expenses	12	trip	$ 250	$ 3,000
			Subtotal	$ 25,000
Semi-Annual sampling				
Reporting	1	lump sum	$ 10,000	$ 10,000
Travel and expenses	24	trip	$ 250	$ 6,000
Sampling equipment	24	day	$ 325	$ 7,800
Lab analysis (VOC, SVOC, Rad, Metals)	50	each	$ 1,000	$ 50,000
Field / sampling labor	24	day	$ 950	$ 22,800
Well maintenance	1	lump sum	$ 2,000	$ 2,000
Data validation	2	lump sum	$ 5,000	$ 10,000
			Subtotal	$ 108,600
5-Year annual review (20% of 5-yr costs)				$ 3,000
Wetlands replication / restoration monitoring (10%)				$ 13,360
Project management / reporting (20%)				$ 26,720
Contingency (10%)				$ 13,360
			Subtotal	$ 56,440
			Subtotal Annual O&M Costs	$ 190,000

Table 10A
Alternative SC-2A - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
Recreational User
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*	*Unit Cost ($)*		*Cost ($)*
C. Present Worth					
Number of Years of O&M	30				
			Subtotal 30 years O&M (Present Worth)	$	3,417,000
TOTAL COST				***$***	***26,057,000***

Notes:

Present Worth of O&M costs calculated using a 4% interest rate.

All soil used in the construction will come from off-site sources. General fill can be any clean soil that can be compacted to a firm structure.
The gas collection and drainage layers will be clean granular material with a permeability of at least 1 x 10-2 cm per second.

Assumes passive collection system - to be confirmed as part of pre-design activities.

Table 10B
Alternative SC-2B - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
Adjacent Resident Without Groundwater Consumption
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*		*Unit Cost ($)*		*Cost ($)*
A. Construction Cost						
Permitting						
Wetlands / landfill / construction coordination	1	lump sum	$	25,000	$	25,000
Deed restriction	1	lump sum	$	10,000	$	10,000
				Subtotal	$	35,000
Site Preparation and General Equipment						
Survey equipment	18	month	$	2,000	$	36,000
Temporary office trailers (2)	36	month	$	500	$	18,000
Temporary storage box	18	month	$	80	$	1,440
Temporary utilities	18	month	$	1,000	$	18,000
Office equipment	1	lump sum	$	10,000	$	10,000
Parking / access roads	300	square yard	$	7	$	1,950
Security system	1	lump sum	$	2,500	$	2,500
Rental toilets	36	month	$	150	$	5,400
Silt fence	5,000	linear foot	$	1	$	3,750
Structural / residential survey	1	lump sum	$	2,500	$	2,500
Signage	7	each	$	150	$	1,050
Endangered species survey	1	lump sum	$	2,500	$	2,500
Air monitoring	18	month	$	1,250	$	22,500
Dust monitoring	18	month	$	900	$	16,200
PPE / safety supplies	18	month	$	2,500	$	45,000
Decon supplies	18	month	$	1,000	$	18,000
Radiation monitoring	18	month	$	2,000	$	36,000
Equipment / trailer mob / demob	3	lump sum	$	3,000	$	9,000
Contractor mobilization	1	lump sum	$	40,000	$	40,000
Excavator rental	36	month	$	7,500	$	270,000
Dozer rental	36	month	$	5,000	$	180,000
Front end loader rental	36	month	$	7,500	$	270,000
Dump truck rental	36	month	$	5,000	$	180,000
Water truck rental	18	month	$	3,000	$	54,000
Site vehicles / gas	18	month	$	7,500	$	135,000
				Subtotal	$	1,378,790
Dewatering						
Pumps and lay-flat hoses	8	month	$	5,000	$	40,000
Water treatment / stormwater management	8	month	$	75,000	$	600,000
				Subtotal	$	640,000
PCB and Dioxins Consolidation and Offsite Disposal						
Disposal characterization analysis	7	each	$	500	$	3,500
Debris disposal	500	cubic yard	$	200	$	100,000
Gondola / transport	2,900	cubic yard	$	300	$	870,000
Disposal at facility	2,900	cubic yard	$	500	$	1,450,000
Confirmatory analysis	38	each	$	300	$	11,400
				Subtotal	$	2,434,900

Table 10B
Alternative SC-2B - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
Adjacent Resident Without Groundwater Consumption
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*	*Unit Cost ($)*	*Cost ($)*
Radiological Consolidation and Offsite Disposal				
Disposal characterization analysis	24	each	$ 500	$ 12,000
Debris disposal	500	cubic yard	$ 200	$ 100,000
Gondola / transport	10,046	cubic yard	$ 300	$ 3,013,800
Disposal at facility	10,046	cubic yard	$ 500	$ 5,023,000
Confirmatory analysis	67	each	$ 300	$ 20,100
			Subtotal	$ 8,168,900
Consolidation - Tongue Area (No Offsite Disposal)				
Confirmatory analysis	32	each	$ 500	$ 16,000
Backfill	9,317	cubic yard	$ 9	$ 83,849
Backfill analysis	12	each	$ 500	$ 6,000
			Subtotal	$ 105,849
Consolidation - Inner Rung (No Offsite Disposal)				
Confirmatory analysis	50	each	$ 300	$ 15,000
Backfill	2,222	cubic yard	$ 9	$ 19,998
Backfill analysis	3	each	$ 500	$ 1,500
Wetland restoration	0.7	acre	$ 75,000	$ 52,500
			Subtotal	$ 88,998
Consolidation - Wetlands Replication Area (No Offsite Disposal)				
Confirmatory analysis	57	each	$ 300	$ 17,100
Backfill	2,455	cubic yard	$ 9	$ 22,095
Backfill analysis	3	each	$ 500	$ 1,500
Wetland restoration	3.2	acre	$ 75,000	$ 240,000
			Subtotal	$ 280,695
Cap Materials				
Clearing and grubbing - entire site	9.3	acre	$ 1,000	$ 9,250
Common / structural fill (for grading)	5,000	cubic yard	$ 9	$ 45,000
12" soil gas venting layer	8,809	cubic yard	$ 23	$ 202,602
Gas collection piping	1,600	linear foot	$ 8	$ 12,000
Passive Gas Vent Risers	10	linear foot	$ 150	$ 1,500
Geosynthetic clay liner	237,838	square foot	$ 0.58	$ 137,946
40 mil VLDPE flexible membrane liner	237,838	square foot	$ 0.42	$ 99,892
12 " drainage layer (granular soil)	8,809	cubic yard	$ 23	$ 202,602
4" dia. PE drainage tubing (cover drain)	2,000	linear foot	$ 8	$ 15,000
Protective soil	9,300	cubic yard	$ 9	$ 83,700
Topsoil	4,404	cubic yard	$ 17	$ 74,875
Hydroseeding	8,809	square yard	$ 0.50	$ 4,404
Erosion control mat	237,838	square foot	$ 0.32	$ 76,108
Drainage swales	2,700	linear foot	$ 3	$ 6,750
24' Gate	2	each	$ 2,000	$ 4,000
Chain link fence	2,900	linear foot	$ 12	$ 34,800
Retention pond	1	lump sum	$ 20,000	$ 20,000
Monitoring well installation	20	each	$ 1,000	$ 20,000
			Subtotal	$ 1,050,430

Table 10B
Alternative SC-2B - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
Adjacent Resident Without Groundwater Consumption
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*		*Unit Cost ($)*		*Cost ($)*
Install Public Waterline						
Coordination with stakeholders	1	ls	$	12,000		$12,000
Residential connections	2	ea	$	6,000		$12,000
New connection permit	2	ls	$	3,300		$6,600
Tapping, materials, and road repair	2	ea	$	2,500		$5,000
Abandon existing wells / plumb new connections	2	ea	$	5,000		$10,000
Extend 10" water main	4,000	foot	$	110		$440,000
Fire hydrant installation	2	ea	$	10,000		$20,000
Extend waterline under railroad tracks	1	ls	$	125,000		$125,000
				Subtotal		$630,600
Replace / Raise high-voltage transmission lines and towers					$	1,000,000
Contractor labor (15%)					$	2,216,874
Design (10%)					$	1,477,916
Engineering and construction oversight (15%)					$	2,216,874
Contingency (20%)					$	2,962,832
				Subtotal	$	9,874,497
				Subtotal Construction Costs	$	24,689,000
B. Annual Operation, Maintenance, & Monitoring Cost						
Cover mowing	2	each	$	3,000	$	6,000
Cover erosion and subsidence repair	1	lump sum	$	4,000	$	4,000
Cap Inspection						
Inspection	12	day	$	1,000	$	12,000
Travel and expenses	12	trip	$	250	$	3,000
				Subtotal	$	25,000
Semi-Annual sampling						
Reporting	1	lump sum	$	10,000	$	10,000
Travel and expenses	24	trip	$	250	$	6,000
Sampling equipment	24	day	$	325	$	7,800
Lab analysis (VOC, SVOC, Rad, Metals)	50	each	$	1,000	$	50,000
Field / sampling labor	24	day	$	950	$	22,800
Well maintenance	1	lump sum	$	2,000	$	2,000
Data validation	2	lump sum	$	5,000	$	10,000
			Subtotal		$	108,600
5-Year annual review (20% of 5-yr costs)					$	3,000
Wetlands replication / restoration monitoring (10%)					$	13,360
Project management / reporting (20%)					$	26,720
Contingency (10%)					$	13,360
				Subtotal	$	56,440
				Subtotal Annual O&M Costs	$	190,000

Table 10B
Alternative SC-2B - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
Adjacent Resident Without Groundwater Consumption
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*	*Unit Cost ($)*		*Cost ($)*
C. Present Worth					
Number of Years of O&M	30				
			Subtotal 30 years O&M (Present Worth)	$	3,417,000
TOTAL COST				***$***	***28,106,000***

Notes:

Present Worth of O&M costs calculated using a 4% interest rate.

All soil used in the construction will come from off-site sources. General fill can be any clean soil that can be compacted to a firm structure. The gas collection and drainage layers will be clean granular material with a permeability of at least 1 x 10-2 cm per second.

Assumes passive collection system - to be confirmed as part of pre-design activities.

Table 10C
Alternative SC-2C - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
Adjacent Resident With Groundwater Consumption
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*	*Unit Cost ($)*	*Cost ($)*
A. Construction Cost				
Permitting				
Wetlands / landfill / construction coordination	1	lump sum	$ 25,000	$ 25,000
Deed restriction	1	lump sum	$ 10,000	$ 10,000
			Subtotal	$ 35,000
Site Preparation and General Equipment				
Survey equipment	25	month	$ 2,000	$ 50,000
Temporary office trailers (2)	50	month	$ 500	$ 25,000
Temporary storage box	25	month	$ 80	$ 2,000
Temporary utilities	25	month	$ 1,000	$ 25,000
Office equipment	1	lump sum	$ 10,000	$ 10,000
Parking / access roads	300	square yard	$ 7	$ 1,950
Security system	1	lump sum	$ 2,500	$ 2,500
Rental toilets	50	month	$ 150	$ 7,500
Silt fence	5,000	linear foot	$ 1	$ 3,750
Structural / residential survey	1	lump sum	$ 2,500	$ 2,500
Signage	7	each	$ 150	$ 1,050
Endangered species survey	1	lump sum	$ 2,500	$ 2,500
Air monitoring	25	month	$ 1,250	$ 31,250
Dust monitoring	25	month	$ 900	$ 22,500
PPE / safety supplies	25	month	$ 2,500	$ 62,500
Decon supplies	25	month	$ 1,000	$ 25,000
Radiation monitoring	25	month	$ 2,000	$ 50,000
Equipment / trailer mob / demob	3	lump sum	$ 3,000	$ 9,000
Contractor mobilization	1	lump sum	$ 40,000	$ 40,000
Excavator rental	50	month	$ 7,500	$ 375,000
Dozer rental	50	month	$ 5,000	$ 250,000
Front end loader rental	50	month	$ 7,500	$ 375,000
Dump truck rental	50	month	$ 5,000	$ 250,000
Water truck rental	25	month	$ 3,000	$ 75,000
Site vehicles / gas	25	month	$ 7,500	$ 187,500
			Subtotal	$ 1,886,500
Dewatering				
Pumps and lay-flat hoses	15	month	$ 5,000	$ 75,000
Water treatment / stormwater management	15	month	$ 75,000	$ 1,125,000
			Subtotal	$ 1,200,000
PCB and Dioxins Consolidation and Offsite Disposal				
Disposal characterization analysis	7	each	$ 500	$ 3,500
Debris disposal	500	cubic yard	$ 200	$ 100,000
Gondola / transport	2,900	cubic yard	$ 300	$ 870,000
Disposal at facility	2,900	cubic yard	$ 500	$ 1,450,000
Confirmatory analysis	38	each	$ 300	$ 11,400
			Subtotal	$ 2,434,900

Table 10C
Alternative SC-2C - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
Adjacent Resident With Groundwater Consumption
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*	*Unit Cost ($)*	*Cost ($)*
Radiological Consolidation and Offsite Disposal				
Disposal characterization analysis	145	each	$ 500	$ 72,500
Debris disposal	500	cubic yard	$ 200	$ 100,000
Gondola / transport	60,437	cubic yard	$ 300	$ 18,131,100
Disposal at facility	60,437	cubic yard	$ 500	$ 30,218,500
Confirmatory analysis	332	each	$ 300	$ 99,600
			Subtotal	$ 48,621,700
Consolidation - Tongue Area (No Offsite Disposal)				
Confirmatory analysis	32	each	$ 300	$ 9,600
Backfill	9,317	cubic yard	$ 9	$ 83,853
Backfill analysis	12	each	$ 500	$ 6,000
			Subtotal	$ 99,453
Consolidation - Inner Rung (No Offsite Disposal)				
Confirmatory analysis	50	each	$ 300	$ 15,000
Backfill	2,222	cubic yard	$ 9	$ 19,998
Backfill analysis	3	each	$ 500	$ 1,500
Wetland restoration	0.7	acre	$ 75,000	$ 52,500
			Subtotal	$ 88,998
Consolidation - Wetlands Replication Area (No Offsite Disposal)				
Confirmatory analysis	31	each	$ 300	$ 9,300
Backfill	1,109	cubic yard	$ 9	$ 9,981
Backfill analysis	2	each	$ 500	$ 1,000
Wetland restoration	3.2	acre	$ 75,000	$ 240,000
			Subtotal	$ 260,281
Cap Materials				
Clearing and grubbing	9.3	acre	$ 1,000	$ 9,250
Common / structural fill (for grading)	5,000	cubic yard	$ 9	$ 45,000
12" soil gas venting layer	8,809	cubic yard	$ 23	$ 202,602
Gas collection piping	1,600	linear foot	$ 8	$ 12,000
Passive Gas Vent Risers	10	linear foot	$ 150	$ 1,500
Geosynthetic clay liner	237,838	square foot	$ 0.58	$ 137,946
40 mil VLDPE flexible membrane liner	237,838	square foot	$ 0.42	$ 99,892
12 " drainage layer (granular soil)	8,809	cubic yard	$ 23	$ 202,602
4" dia. PE drainage tubing (cover drain)	2,000	linear foot	$ 8	$ 15,000
Protective soil	9,300	cubic yard	$ 9	$ 83,700
Topsoil	4,404	cubic yard	$ 17	$ 74,875
Hydroseeding	8,809	square yard	$ 0.50	$ 4,404
Erosion control mat	237,838	square foot	$ 0.32	$ 76,108
Drainage swales	2,700	linear foot	$ 3	$ 6,750
24' Gate	2	each	$ 2,000	$ 4,000
Chain link fence	2,900	linear foot	$ 12	$ 34,800
Retention pond(s)	1	lump sum	$ 20,000	$ 20,000
Monitoring well installation	20	each	$ 1,000	$ 20,000
			Subtotal	$ 1,050,430

Table 10C
Alternative SC-2C - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
Adjacent Resident With Groundwater Consumption
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*		*Unit Cost ($)*		*Cost ($)*
Install Public Waterline						
Coordination with stakeholders	1	ls	$	12,000		$12,000
Residential connections	2	ea	$	6,000		$12,000
New connection permit	2	ls	$	3,300		$6,600
Tapping, materials, and road repair	2	ea	$	2,500		$5,000
Abandon existing wells / plumb new connections	2	ea	$	5,000		$10,000
Extend 10" water main	4,000	foot	$	110		$440,000
Fire hydrant installation	2	ea	$	10,000		$20,000
Extend waterline under railroad tracks	1	ls	$	125,000		$125,000
				Subtotal		$630,600
Replace / Raise high-voltage transmission lines and towers					$	1,000,000
Contractor labor (15%)					$	8,440,929
Design (10%)					$	5,627,286
Engineering and construction oversight (15%)					$	8,440,929
Contingency (20%)					$	11,261,572
				Subtotal	$	34,770,717
				Subtotal Construction Costs	$	91,079,000
B. Annual Operation, Maintenance, & Monitoring Cost						
Cover mowing	2	each	$	3,000	$	6,000
Cover erosion and subsidence repair	1	lump sum	$	5,000	$	5,000
Cap Inspection						
Inspection	12	day	$	1,000	$	12,000
Travel and expenses	12	trip	$	250	$	3,000
				Subtotal	$	26,000
Semi-Annual sampling						
Reporting	1	lump sum	$	10,000	$	10,000
Travel and expenses	24	trip	$	250	$	6,000
Sampling equipment	24	day	$	325	$	7,800
Lab analysis (VOC, SVOC, Rad, Metals)	50	each	$	1,000	$	50,000
Field / sampling labor	24	day	$	950	$	22,800
Well maintenance	1	lump sum	$	2,000	$	2,000
Data validation	2	lump sum	$	5,000	$	10,000
				Subtotal	$	108,600
5-Year annual review (20% of 5-yr costs)					$	3,000
Wetlands replication / restoration monitoring (10%)					$	13,460
Project management / reporting (20%)					$	26,920
Contingency (10%)					$	13,460
				Subtotal	$	56,840
				Subtotal Annual O&M Costs	$	191,000

Table 10C
Alternative SC-2C - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
Adjacent Resident With Groundwater Consumption
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*	*Unit Cost ($)*		*Cost ($)*
C. Present Worth					
Number of Years of O&M	30				
			Subtotal 30 years O&M (Present Worth)	$	3,435,000
TOTAL COST				***$***	***94,514,000***

Notes:

Present Worth of O&M costs calculated using a 4% interest rate.

All soil used in the construction will come from off-site sources. General fill can be any clean soil that can be compacted to a firm structure. The gas collection and drainage layers will be clean granular material with a permeability of at least 1 x 10-2 cm per second.

Assumes passive collection system - to be confirmed as part of pre-design activities.

Table 10D
Alternative SC-2D - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
Onsite Resident
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*	*Unit Cost ($)*	*Cost ($)*
A. Construction Cost				
Permitting				
Wetlands/landfill/construction coordination	1	lump sum	$ 25,000	$ 25,000
Deed restriction	1	lump sum	$ 10,000	$ 10,000
			Subtotal	$ 35,000
Site Preparation and General Equipment				
Survey equipment	25	month	$ 2,000	$ 50,000
Temporary office trailers (2)	50	month	$ 500	$ 25,000
Temporary storage box	25	month	$ 80	$ 2,000
Temporary utilities	25	month	$ 1,000	$ 25,000
Office equipment	1	lump sum	$ 10,000	$ 10,000
Parking/access roads	300	square yard	$ 7	$ 1,950
Security system	1	lump sum	$ 2,500	$ 2,500
Rental toilets	50	month	$ 150	$ 7,500
Silt fence	5,000	linear foot	$ 1	$ 3,750
Structural/residential survey	1	lump sum	$ 2,500	$ 2,500
Signage	7	each	$ 150	$ 1,050
Endangered species survey	1	lump sum	$ 2,500	$ 2,500
Air monitoring	25	month	$ 1,250	$ 31,250
Dust monitoring	25	month	$ 900	$ 22,500
PPE/safety supplies	25	month	$ 2,500	$ 62,500
Decon supplies	25	month	$ 1,000	$ 25,000
Radiation monitoring	25	month	$ 2,000	$ 50,000
Equipment/trailer mob/demob	3	lump sum	$ 3,000	$ 9,000
Contractor mobilization	1	lump sum	$ 40,000	$ 40,000
Excavator rental	50	month	$ 7,500	$ 375,000
Dozer rental	50	month	$ 5,000	$ 250,000
Front end loader rental	50	month	$ 7,500	$ 375,000
Dump truck rental	50	month	$ 5,000	$ 250,000
Water truck rental	25	month	$ 3,000	$ 75,000
Site vehicles/gas	25	month	$ 7,500	$ 187,500
			Subtotal	$ 1,886,500
Dewatering				
Pumps and lay-flat hoses	15	month	$ 5,000	$ 75,000
Water treatment/stormwater management	15	month	$ 75,000	$ 1,125,000
			Subtotal	$ 1,200,000
PCB and Dioxins Consolidation and Offsite Disposal				
Disposal characterization analysis	7	each	$ 500	$ 3,500
Debris disposal	500	cubic yard	$ 200	$ 100,000
Gondola/transport	2,900	cubic yard	$ 300	$ 870,000
Disposal at facility	2,900	cubic yard	$ 500	$ 1,450,000
Confirmatory analysis	38	each	$ 300	$ 11,400
			Subtotal	$ 2,434,900

Table 10D
Alternative SC-2D - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
Onsite Resident
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*	*Unit Cost ($)*	*Cost ($)*
Radiological Consolidation and Offsite Disposal				
Disposal characterization analysis	154	each	$ 500	$ 77,000
Debris disposal	500	cubic yard	$ 200	$ 100,000
Gondola / transport	64,025	cubic yard	$ 300	$ 19,207,500
Disposal at facility	64,025	cubic yard	$ 500	$ 32,012,500
Confirmatory analysis	255	each	$ 300	$ 76,500
			Subtotal	$ 51,473,500
Consolidation - Tongue Area (No Offsite Disposal)				
Confirmatory analysis	32	each	$ 300	$ 9,600
Backfill	9,317	cubic yard	$ 9	$ 83,853
Backfill analysis	12	each	$ 500	$ 6,000
			Subtotal	$ 99,453
Consolidation - Inner Rung (No Offsite Disposal)				
Confirmatory analysis	50	each	$ 300	$ 15,000
Backfill	2,222	cubic yard	$ 9	$ 19,998
Backfill analysis	3	each	$ 500	$ 1,500
Wetland restoration	0.7	acre	$ 75,000	$ 52,500
			Subtotal	$ 88,998
Consolidation - Wetlands Replication Area (No Offsite Disposal)				
Confirmatory analysis	22	each	$ 300	$ 6,600
Backfill	699	cubic yard	$ 9	$ 6,291
Backfill analysis	2	each	$ 500	$ 1,000
Wetland restoration	3.2	acre	$ 75,000	$ 240,000
			Subtotal	$ 253,891
Cap Materials				
Clearing and grubbing	9.3	acre	$ 1,000	$ 9,250
Common / structural fill (for grading)	5,000	cubic yard	$ 9	$ 45,000
12" soil gas venting layer	8,809	cubic yard	$ 23	$ 202,602
Gas collection piping	1,600	linear foot	$ 8	$ 12,000
Passive Gas Vent Risers	10	linear foot	$ 150	$ 1,500
Geosynthetic clay liner	237,838	square foot	$ 0.58	$ 137,946
40 mil VLDPE flexible membrane liner	237,838	square foot	$ 0.42	$ 99,892
12 " drainage layer (granular soil)	8,809	cubic yard	$ 23	$ 202,602
4" dia. PE drainage tubing (cover drain)	2,000	linear foot	$ 8	$ 15,000
Protective soil	9,300	cubic yard	$ 9	$ 83,700
Topsoil	4,404	cubic yard	$ 17	$ 74,875
Hydroseeding	8,809	square yard	$ 0.50	$ 4,404
Erosion control mat	237,838	square foot	$ 0.32	$ 76,108
Drainage swales	2,700	linear foot	$ 3	$ 6,750
24' Gate	2	each	$ 2,000	$ 4,000
Chain link fence	2,900	linear foot	$ 12	$ 34,800
Retention pond(s)	1	lump sum	$ 20,000	$ 20,000
Monitoring well installation	20	each	$ 1,000	$ 20,000
			Subtotal	$ 1,050,430

Table 10D
Alternative SC-2D - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
Onsite Resident
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*		*Unit Cost ($)*		*Cost ($)*
Install Public Waterline						
Coordination with stakeholders	1	ls	$	12,000		$12,000
Residential connections	2	ea	$	6,000		$12,000
New connection permit	2	ls	$	3,300		$6,600
Tapping, materials, and road repair	2	ea	$	2,500		$5,000
Abandon existing wells / plumb new connections	2	ea	$	5,000		$10,000
Extend 10" water main	4,000	foot	$	110		$440,000
Fire hydrant installation	2	ea	$	10,000		$20,000
Extend waterline under railroad tracks	1	ls	$	125,000		$125,000
				Subtotal		$630,600
Replace / Raise high-voltage transmission lines and towers					$	1,000,000
Contractor labor (15%)					$	8,867,741
Design (10%)					$	5,911,827
Engineering and construction oversight (15%)					$	8,867,741
Contingency (20%)					$	11,830,654
				Subtotal	$	36,477,963
				Subtotal Construction Costs	$	95,631,000
B. Annual Operation, Maintenance, & Monitoring Cost						
Cover mowing	2	each	$	3,000	$	6,000
Cover erosion and subsidence repair	1	lump sum	$	5,000	$	5,000
Cap Inspection						
Inspection	12	day	$	1,000	$	12,000
Travel and expenses	12	trip	$	250	$	3,000
				Subtotal	$	26,000
Semi-Annual sampling						
Reporting	1	lump sum	$	10,000	$	10,000
Travel and expenses	24	trip	$	250	$	6,000
Sampling equipment	24	day	$	325	$	7,800
Lab analysis (VOC, SVOC, Rad, Metals)	50	each	$	1,000	$	50,000
Field / sampling labor	24	day	$	950	$	22,800
Well maintenance	1	lump sum	$	2,000	$	2,000
Data validation	2	lump sum	$	5,000	$	10,000
				Subtotal	$	108,600
5-Year annual review (20% of 5-yr costs)					$	3,000
Wetlands replication / restoration monitoring (10%)					$	13,460
Project management / reporting (20%)					$	26,920
Contingency (10%)					$	13,460
				Subtotal	$	56,840
				Subtotal Annual O&M Costs	$	191,000

Table 10D
Alternative SC-2D - Multi-Barrier Cap/Excavation/Off-Site Disposal of Radiological Material
Onsite Resident
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*	*Unit Cost ($)*		*Cost ($)*
C. Present Worth					
Number of Years of O&M	30				
			Subtotal 30 years O&M (Present Worth)	$	3,435,000
TOTAL COST				***$***	***99,066,000***

Notes:

Present Worth of O&M costs calculated using a 4% interest rate.

All soil used in the construction will come from off-site sources. General fill can be any clean soil that can be compacted to a firm structure.
The gas collection and drainage layers will be clean granular material with a permeability of at least 1 x 10-2 cm per second.

Assumes passive collection system - to be confirmed as part of pre-design activities.

Table 11
Detailed Analysis: Alternative SC-3 - Excavation and Off-Site Disposal
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Detailed Analysis Criteria	Alternative SC-3 - Excavation and Off-Site Disposal
1. Overall Protection of Human Health & the Environment	
Human Health Protection	The results of the baseline human health risk assessment indicate there is a current human helath risk from manganese in the groundwater and a potential future risk to human health at the site from soil, sediment and groundwater. This alternative will protect human health by eliminating exposure to soil and sediment thru excavation and off-site disposal. In addition, exposure to contaminated groundwater will be addressesd by connecting two residences to public water.
Ecological Protection	The results of the baseline ecological risk assessment indicate there is potential risk to ecological receptors from sediment and soil at the site. This alternative would protect ecological health by excavation and off-site disposal of waste materials that present an unaccpetable risk. This would also minimize migration of contaminants from the site to surface water to the extent practicable.
2. Compliance With ARARs	
Chemical-specific ARARs	Under this alternative, chemical-specific ARARs would be met, with the exception of Alternatives SC-3C SC-3D, where groundwater remains a drinking water source. See Tables 1F through 1I for Alternatives SC-3A, SC-3B, SC-3C, and SC-3D ARARs.
Action-specific ARARs	Under this alternative, action-specific ARARs would be met. See Tables 1F through 1I for Alternatives SC-3A, SC-3B, SC-3C, and SC-3D ARARs.
Location-specific ARARs	Under this alternative, action-specific ARARs would be met. See Tables 1F through 1I for Alternatives SC-3A, SC-3B, SC-3C, and SC-3D ARARs.
Other criteria, advisories and guidances	Site activities would consider all other criteria, advisories or guidance identified in Tables 1F through 1I for Alternatives SC-3A, SC-3B, SC-3C, and SC-3D ARARs.
3. Long-Term Effectiveness & Permanence	
Magnitude of residual risk	The residual risks that will remain will be very small in that all soil and sediment that exceed cleanup levels will be removed from the site through excavation and off-site disposal. Current groundwater risk will be addressed by connecting two residences to public water. It is anticipated that groundwater may have a "low use and value" in the future and will, therefore, no longer be considered a drinking water source. If that is the case, than the magnitude of the residual risk would be low.
Adequacy and reliability of controls	Excavation and two public water connections and construction are very reliable remedial technologies. Upon completion of excavation and offsite disposal, no site controls are required other than possible groundwater monitoring.

Table 11
Detailed Analysis: Alternative SC-3 - Excavation and Off-Site Disposal
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Detailed Analysis Criteria	Alternative SC-3 - Excavation and Off-Site Disposal
4. Reduction of Toxicity, Mobility & Volume Through Treatment	
Treatment process used and materials treated	Source area materials would be treated and/or stabilized in accordance with the offsite disposal facility's standard practices.
Amount of hazardous materials removed or treated	Depending upon the exposure scenario proposed, different quantities of waste materials will be excavated and removed from the Site for off-site disposal under the various alternatives.
Degree of expected reductions in toxicity, mobility and volume	Excavation would permanently remove all radiation and chemical contaminated waste from the from the Site above cleanup levels thereby reducing the volume at the site, decreasing mobility and toxicity.
Degree to which treatment is reversible	Excavation and off-site disposal are potentially reversible. Some materials disposed of off-site may require treatment prior to disposal, and this treatment would be irreversible.
Type and quantity of residuals remaining after treatment	After excavation is completed, residual waste that remains will be at levels that do not present an unacceptable risk. Because waste exceeding cleanup levels will remain on-site beneath the cap, the cap must be regularly inspected and maintained to minimize risk in the future. Current groundwater risk will be addressed by connecting two residences to public water. Because groundwater is not being addressed other than by connecting two residences to public water, contaminants would remain in groundwater. It is anticipated that groundwater may have a low use and value in the future and no longer be considered a drinking water source. If that is the case, residual groundwater contamination will remain, but will not present a risk.
5. Short-Term Effectiveness	
Protection of community during remedial actions	Excavation activities and construction activities would be completed in accordance with all required health and safety regulations and procedures. A traffic control plan would be implemented to address increased truck traffic in the area to minimize risk to the community. Site perimeter air, noise, and dust monitoring would be conducted to verify that site work is conducted in a manner that is safe for the community.
Protection of workers during remedial actions	Excavation and construction activities would be completed in accordance with required health and safety regulations and procedures. Site workers would don appropriate PPE during site work. Air monitoring and engineering controls would be instituted to assess and minimize worker exposure.
Environmental impacts	An endangered species survey would be conducted prior to site work and appropriate measures taken to address legal requirements related to endangered species. Because this alternative requires excavation in wetland areas, actions will be taken to minimize impacts to the extent practicable.
Time until remedial action objectives are achieved	Depending on the selected risk scenario, this alternative can be completed between approximately 9 and 16 months.

Table 11
Detailed Analysis: Alternative SC-3 - Excavation and Off-Site Disposal
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Detailed Analysis Criteria	Alternative SC-3 - Excavation and Off-Site Disposal
6. Implementability	
Ability to construct and operate the technology	It is possible to complete excavation and connect two residences to public water at the site.
Reliability of the technology	Excavation with offsite disposal and connecting two residences to public water are standard, reliable technologies with a proven history of success at similar sites.
Ease of undertaking additional remedial actions, if necessary	Additional excavation, treatment, capping, and / or other technologies can be implemented after completing this alternative.
Ability to monitor effectiveness of remedy	Post-excavation confirmatory samples would determine whether an area has been successfully remediated to PRGs.
Ability to obtain approvals from other agencies	This is a standard waste disposal technology with clear regulatory requirements. Because excavation will take place on-site, no additional approvals are needed. In accordance with CERCLA, connecting two residences to public water will not require a permit. Waste materials that are sent off-site for disposal will be sent to licensed waste disposal facilities so addtional approvals should be minimal, if required at all.
Coordination with other agencies	Coordination would be required with the MADEP, USACE, various departments within the Towns of Norton and Attleboro, and National Grid.
Availability of off-site treatment, storage and disposal services and capacity	Facilities are available to accept the sources area material proposed to be excavated and disposed of off-site.
Availability of necessary equipment and specialists	The personnel, materials, and equipment required to implement this alternative are readily available.
Availability of prospective technologies	Excavation and off-site disposal and connecting two residences to public water have been completed at similar sites and are readily available.
7. Cost	
Capital cost	· Recreational user – $54,055,000 · Adjacent Resident without GW exposure – $55,553,000 · Adjacent Resident with GW exposure – $120,888,000 · Onsite Resident – $126,868,000
Present worth of O&M cost (30 years)	None ($0)
Total estimated cost	· Recreational user – $54,055,000 · Adjacent Resident without GW exposure – $55,553,000 · Adjacent Resident with GW exposure – $120,888,000 · Onsite Resident – $126,868,000

Table 12A
Alternative SC-3A - Excavation and Offsite Disposal
Recreational User
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*	*Unit Cost ($)*	*Cost ($)*
A. Construction Cost				
Permitting				
Wetlands / landfill / construction coordination	1	lump sum	$ 25,000	$ 25,000
Deed restriction	1	lump sum	$ 10,000	$ 10,000
			Subtotal	$ 35,000
Site Preparation and General Equipment				
Survey equipment	9	month	$ 2,000	$ 18,000
Temporary office trailer	18	month	$ 500	$ 9,000
Temporary storage box	9	month	$ 80	$ 720
Temporary utilities	9	month	$ 1,000	$ 9,000
Office equipment	1	lump sum	$ 10,000	$ 10,000
Parking / access roads	300	square yard	$ 7	$ 1,950
Security system	1	lump sum	$ 2,500	$ 2,500
Rental toilets	18	month	$ 150	$ 2,700
Silt fence	5,000	linear foot	$ 1	$ 3,750
Structural / residential survey	1	lump sum	$ 2,500	$ 2,500
Signage	9	each	$ 150	$ 1,350
Endangered species survey	1	lump sum	$ 2,500	$ 2,500
Air monitoring	9	month	$ 1,250	$ 11,250
Dust monitoring	9	month	$ 900	$ 8,100
PPE / safety supplies	9	month	$ 2,500	$ 22,500
Decon supplies	9	month	$ 1,000	$ 9,000
Radiation monitoring	9	month	$ 2,000	$ 18,000
Equipment / trailer mob / demob	1	lump sum	$ 1,500	$ 1,500
Contractor mobilization	1	lump sum	$ 40,000	$ 40,000
Excavator rental	27	month	$ 7,500	$ 202,500
Dozer rental	9	month	$ 5,000	$ 45,000
Front end loader rental	9	month	$ 7,500	$ 67,500
Dump truck rental	18	month	$ 5,000	$ 90,000
Water truck rental	9	month	$ 3,000	$ 27,000
Site vehicles / gas	9	month	$ 7,500	$ 67,500
			Subtotal	$ 673,820
Dewatering				
Pumps and lay-flat hoses	7	month	$ 5,000	$ 35,000
Water treatment / stormwater management	7	month	$ 75,000	$ 525,000
			Subtotal	$ 560,000
Offsite Disposal				
Main Site - Rad and Chemical PRG Exceedences & TSCA				
Disposal characterization analysis	79	each	$ 500	$ 39,500
Debris disposal	500	cubic yard	$ 200	$ 100,000
Gondola / transport	32,850	cubic yard	$ 300	$ 9,855,000
Disposal at facility	32,850	cubic yard	$ 500	$ 16,425,000
Confirmatory analysis	193	each	$ 300	$ 57,900
Backfill	32,850	cubic yard	$ 9	$ 295,650
Backfill analysis	39	each	$ 500	$ 19,500
			Subtotal	$ 26,792,550

Table 12A
Alternative SC-3A - Excavation and Offsite Disposal
Recreational User
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*		*Unit Cost ($)*		*Cost ($)*
Ecological - "Inner Rung" Near Tongue Area						
Disposal characterization analysis	6	each	$	500	$	3,000
Gondola / transport	2,222	cubic yard	$	300	$	666,600
Disposal at facility	2,222	cubic yard	$	500	$	1,111,000
Confirmatory analysis	50	each	$	300	$	15,000
Backfill	2,222	cubic yard	$	9	$	19,998
Backfill analysis	3	each	$	500	$	1,500
Wetland restoration	0.7	acre	$	75,000	$	52,500
				Subtotal	$	1,869,598
Ecological - Onsite Isolated Seasonal Wetlands						
Disposal characterization analysis	7	each	$	500	$	3,500
Gondola / transport	2,895	cubic yard	$	300	$	868,500
Disposal at facility	2,895	cubic yard	$	500	$	1,447,500
Confirmatory analysis	64	each	$	300	$	19,200
Backfill	2,895	cubic yard	$	9	$	26,055
Backfill analysis	3	each	$	500	$	1,500
Wetland restoration	3.2	acre	$	75,000	$	240,000
				Subtotal	$	2,606,255
Install Public Waterline						
Coordination with stakeholders	1	ls	$	12,000		$12,000
Residential connections	2	ea	$	6,000		$12,000
New connection permit	2	ls	$	3,300		$6,600
Tapping, materials, and road repair	2	ea	$	2,500		$5,000
Abandon existing wells / plumb new connections	2	ea	$	5,000		$10,000
Extend 10" water main	4,000	foot	$	110		$440,000
Fire hydrant installation	2	ea	$	10,000		$20,000
Extend waterline under railroad tracks	1	ls	$	125,000		$125,000
				Subtotal		$630,600
Replace / Raise high-voltage transmission lines and towers					$	1,000,000
Contractor labor (15%)					$	4,969,920
Design (10%)					$	3,313,280
Engineering and construction oversight (15%)					$	4,969,920
Contingency (20%)					$	6,633,560
				Subtotal	$	20,886,680
				Subtotal Construction Costs	$	54,055,000

B. Annual Operations, Maintenance, & Management Costs

There are no operations, maintenance, and management costs associated with this alternative.

				Subtotal	$	-
					$	-

C. Present Worth

Number of Years of O&M	-					
					$	-

TOTAL COST					***$***	***54,055,000***

Table 12B
Alternative SC-3B - Excavation and Offsite Disposal
Adjacent Resident Without Groundwater Consumption
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*	*Unit Cost ($)*	*Cost ($)*
A. Construction Cost				
Permitting				
Wetlands / landfill / construction coordination	1	lump sum	$ 25,000	$ 25,000
Deed restriction	1	lump sum	$ 10,000	$ 10,000
			Subtotal	$ 35,000
Site Preparation and General Equipment				
Survey equipment	9	month	$ 2,000	$ 18,000
Temporary office trailer	18	month	$ 500	$ 9,000
Temporary storage box	9	month	$ 80	$ 720
Temporary utilities	9	month	$ 1,000	$ 9,000
Office equipment	1	lump sum	$ 10,000	$ 10,000
Parking / access roads	300	square yard	$ 7	$ 1,950
Security system	1	lump sum	$ 2,500	$ 2,500
Rental toilets	18	month	$ 150	$ 2,700
Silt fence	5,000	linear foot	$ 1	$ 3,750
Structural / residential survey	1	lump sum	$ 2,500	$ 2,500
Signage	9	each	$ 150	$ 1,350
Endangered species survey	1	lump sum	$ 2,500	$ 2,500
Air monitoring	9	month	$ 1,250	$ 11,250
Dust monitoring	9	month	$ 900	$ 8,100
PPE / safety supplies	9	month	$ 2,500	$ 22,500
Decon supplies	9	month	$ 1,000	$ 9,000
Radiation monitoring	9	month	$ 2,000	$ 18,000
Equipment / trailer mob / demob	1	lump sum	$ 1,500	$ 1,500
Contractor mobilization	1	lump sum	$ 40,000	$ 40,000
Excavator rental	27	month	$ 7,500	$ 202,500
Dozer rental	9	month	$ 5,000	$ 45,000
Front end loader rental	9	month	$ 7,500	$ 67,500
Dump truck rental	18	month	$ 5,000	$ 90,000
Water truck rental	9	month	$ 3,000	$ 27,000
Site vehicles / gas	9	month	$ 7,500	$ 67,500
			Subtotal	$ 673,820
Dewatering				
Pumps and lay-flat hoses	7	month	$ 5,000	$ 35,000
Water treatment / stormwater management	7	month	$ 75,000	$ 525,000
			Subtotal	$ 560,000
Offsite Disposal				
Main Site - Rad and Chemical PRG Exceedences & TSCA				
Disposal characterization analysis	83	each	$ 500	$ 41,500
Debris disposal	500	cubic yard	$ 200	$ 100,000
Gondola / transport	34,445	cubic yard	$ 300	$ 10,333,500
Disposal at facility	34,445	cubic yard	$ 500	$ 17,222,500
Confirmatory analysis	198	each	$ 300	$ 59,400
Backfill	34,445	cubic yard	$ 9	$ 310,005
Backfill analysis	41	each	$ 500	$ 20,500
			Subtotal	$ 28,087,405

Table 12B
Alternative SC-3B - Excavation and Offsite Disposal
Adjacent Resident Without Groundwater Consumption
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*	*Unit Cost ($)*	*Cost ($)*
Ecological - "Inner Rung" Near Tongue Area				
Disposal characterization analysis	6	each	$ 500	$ 3,000
Gondola / transport	2,222	cubic yard	$ 300	$ 666,600
Disposal at facility	2,222	cubic yard	$ 500	$ 1,111,000
Confirmatory analysis	50	each	$ 300	$ 15,000
Backfill	2,222	cubic yard	$ 9	$ 19,998
Backfill analysis	3	each	$ 500	$ 1,500
Wetland restoration	0.7	acre	$ 75,000	$ 52,500
			Subtotal	$ 1,869,598
Ecological - Onsite Isolated Seasonal Wetlands				
Disposal characterization analysis	7	each	$ 500	$ 3,500
Gondola / transport	2,455	cubic yard	$ 300	$ 736,500
Disposal at facility	2,455	cubic yard	$ 500	$ 1,227,500
Confirmatory analysis	57	each	$ 300	$ 17,100
Backfill	2,455	cubic yard	$ 9	$ 22,095
Backfill analysis	3	each	$ 500	$ 1,500
Wetland restoration	3.2	acre	$ 75,000	$ 240,000
			Subtotal	$ 2,248,195
Install Public Waterline				
Coordination with stakeholders	1	ls	$ 12,000	$12,000
Residential connections	2	ea	$ 6,000	$12,000
New connection permit	2	ls	$ 3,300	$6,600
Tapping, materials, and road repair	2	ea	$ 2,500	$5,000
Abandon existing wells / plumb new connections	2	ea	$ 5,000	$10,000
Extend 10" water main	4,000	foot	$ 110	$440,000
Fire hydrant installation	2	ea	$ 10,000	$20,000
Extend waterline under railroad tracks	1	ls	$ 125,000	$125,000
			Subtotal	$630,600
Replace / Raise high-voltage transmission lines and towers				$ 1,000,000
Contractor labor (15%)				$ 5,110,440
Design (10%)				$ 3,406,960
Engineering and construction oversight (15%)				$ 5,110,440
Contingency (20%)				$ 6,820,920
			Subtotal	$ 21,448,760
			Subtotal Construction Costs	$ 55,553,000
B. Annual Operations, Maintenance, & Management Costs				
There are no operations, maintenance, and management costs associated with this alternative.				
			Subtotal	$ -
				$ -
C. Present Worth				
Number of Years of O&M	-			
				$ -
TOTAL COST				***$ 55,553,000***

Table 12C
Alternative SC-3C - Excavation and Offsite Disposal
Adjacent Resident With Groundwater Consumption
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*		*Unit Cost ($)*		*Cost ($)*
A. Construction Cost						
Permitting						
Wetlands / landfill / construction coordination	1	lump sum	$	25,000	$	25,000
Deed restriction	1	lump sum	$	10,000	$	10,000
				Subtotal	$	35,000
Site Preparation and General Equipment						
Survey equipment	16	month	$	2,000	$	32,000
Temporary office trailer	32	month	$	500	$	16,000
Temporary storage box	16	month	$	80	$	1,280
Temporary utilities	16	month	$	1,000	$	16,000
Office equipment	1	lump sum	$	10,000	$	10,000
Parking / access roads	300	square yard	$	7	$	1,950
Security system	1	lump sum	$	2,500	$	2,500
Rental toilets	32	month	$	150	$	4,800
Silt fence	5,000	linear foot	$	1	$	3,750
Structural / residential survey	1	lump sum	$	2,500	$	2,500
Signage	7	each	$	150	$	1,050
Endangered species survey	1	lump sum	$	2,500	$	2,500
Air monitoring	16	month	$	1,250	$	20,000
Dust monitoring	16	month	$	900	$	14,400
PPE / safety supplies	16	month	$	2,500	$	40,000
Decon supplies	16	month	$	1,000	$	16,000
Radiation monitoring	16	month	$	2,000	$	32,000
Equipment / trailer mob / demob	1	lump sum	$	1,500	$	1,500
Contractor mobilization	1	lump sum	$	40,000	$	40,000
Excavator rental	48	month	$	7,500	$	360,000
Dozer rental	16	month	$	5,000	$	80,000
Front end loader rental	16	month	$	7,500	$	120,000
Dump truck rental	32	month	$	5,000	$	160,000
Water truck rental	16	month	$	3,000	$	48,000
Site vehicles / gas	16	month	$	7,500	$	120,000
				Subtotal	$	1,146,230
Dewatering						
Pumps and lay-flat hoses	14	month	$	5,000	$	70,000
Water treatment / stormwater management	14	month	$	75,000	$	1,050,000
				Subtotal	$	1,120,000
Offsite Disposal						
Main Site - Rad and Chemical PRG Exceedences & TSCA						
Disposal characterization analysis	204	each	$	500	$	102,000
Debris disposal	500	cubic yard	$	200	$	100,000
Gondola / transport	84,836	cubic yard	$	300	$	25,450,800
Disposal at facility	84,836	cubic yard	$	500	$	42,418,000
Confirmatory analysis	346	each	$	300	$	103,800
Backfill	84,836	cubic yard	$	9	$	763,524
Backfill analysis	102	each	$	500	$	51,000
				Subtotal	$	68,989,124
Ecological - "Inner Rung" Near Tongue Area						
Disposal characterization analysis	6	each	$	500	$	3,000
Gondola / transport	2,222	cubic yard	$	300	$	666,600
Disposal at facility	2,222	cubic yard	$	500	$	1,111,000
Confirmatory analysis	50	each	$	300	$	15,000
Backfill	2,222	cubic yard	$	9	$	19,998
Backfill analysis	3	each	$	500	$	1,500
Wetland restoration	0.7	acre	$	75,000	$	52,500
				Subtotal	$	1,869,598

Table 12C
Alternative SC-3C - Excavation and Offsite Disposal
Adjacent Resident With Groundwater Consumption
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	***No. of Units***	***Units***	***Unit Cost ($)***	***Cost ($)***
Ecological - Onsite Isolated Seasonal Wetlands				
Disposal characterization analysis	3	each	$ 500	$ 1,500
Gondola / transport	1,109	cubic yard	$ 300	$ 332,700
Disposal at facility	1,109	cubic yard	$ 500	$ 554,500
Confirmatory analysis	31	each	$ 300	$ 9,300
Backfill	1,109	cubic yard	$ 9	$ 9,981
Backfill analysis	1	each	$ 500	$ 500
Wetland restoration	3.2	acre	$ 75,000	$ 240,000
			Subtotal	$ 1,148,481
Install Public Waterline				
Coordination with stakeholders	1	ls	$ 12,000	$12,000
Residential connections	2	ea	$ 6,000	$12,000
New connection permit	2	ls	$ 3,300	$6,600
Tapping, materials, and road repair	2	ea	$ 2,500	$5,000
Abandon existing wells / plumb new connections	2	ea	$ 5,000	$10,000
Extend 10" water main	4,000	foot	$ 110	$440,000
Fire hydrant installation	2	ea	$ 10,000	$20,000
Extend waterline under railroad tracks	1	ls	$ 125,000	$125,000
			Subtotal	$630,600
Replace / Raise high-voltage transmission lines and towers				$ 1,000,000
Contractor labor (15%)				$ 11,235,600
Design (10%)				$ 7,490,400
Engineering and construction oversight (15%)				$ 11,235,600
Contingency (20%)				$ 14,987,810
			Subtotal	$ 45,949,410
			Subtotal Construction Costs	$ 120,888,000
B. Annual Operations, Maintenance, & Management Costs				
There are no operations, maintenance, and management costs associated with this alternative.				
			Subtotal	$ -
				$ -
C. Present Worth				
Number of Years of O&M	-			
				$ -
TOTAL COST				***$ 120,888,000***

Table 12D
Alternative SC-3D - Excavation and Offsite Disposal
Onsite Resident
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	*No. of Units*	*Units*	*Unit Cost ($)*	*Cost ($)*
A. Construction Cost				
Permitting				
Wetlands / landfill / construction coordination	1	lump sum	$ 25,000	$ 25,000
Deed restriction	1	lump sum	$ 10,000	$ 10,000
			Subtotal	$ 35,000
Site Preparation and General Equipment				
Survey equipment	16	month	$ 2,000	$ 32,000
Temporary office trailer	32	month	$ 500	$ 16,000
Temporary storage box	16	month	$ 80	$ 1,280
Temporary utilities	16	month	$ 1,000	$ 16,000
Office equipment	1	lump sum	$ 10,000	$ 10,000
Parking / access roads	300	square yard	$ 7	$ 1,950
Security system	1	lump sum	$ 2,500	$ 2,500
Rental toilets	32	month	$ 150	$ 4,800
Silt fence	5,000	linear foot	$ 1	$ 3,750
Structural / residential survey	1	lump sum	$ 2,500	$ 2,500
Signage	7	each	$ 150	$ 1,050
Endangered species survey	1	lump sum	$ 2,500	$ 2,500
Air monitoring	16	month	$ 1,250	$ 20,000
Dust monitoring	16	month	$ 900	$ 14,400
PPE / safety supplies	16	month	$ 2,500	$ 40,000
Decon supplies	16	month	$ 1,000	$ 16,000
Radiation monitoring	16	month	$ 2,000	$ 32,000
Equipment / trailer mob / demob	1	lump sum	$ 1,500	$ 1,500
Contractor mobilization	1	lump sum	$ 40,000	$ 40,000
Excavator rental	48	month	$ 7,500	$ 360,000
Dozer rental	16	month	$ 5,000	$ 80,000
Front end loader rental	16	month	$ 7,500	$ 120,000
Dump truck rental	32	month	$ 5,000	$ 160,000
Water truck rental	16	month	$ 3,000	$ 48,000
Site vehicles / gas	16	month	$ 7,500	$ 120,000
			Subtotal	$ 1,146,230
Dewatering				
Pumps and lay-flat hoses	14	month	$ 5,000	$ 70,000
Water treatment / stormwater management	14	month	$ 75,000	$ 1,050,000
			Subtotal	$ 1,120,000
Offsite Disposal				
Main Site - Rad and Chemical PRG Exceedences & TSCA				
Disposal characterization analysis	208	each	$ 500	$ 104,000
Debris disposal	500	cubic yard	$ 200	$ 100,000
Gondola / transport	89,859	cubic yard	$ 300	$ 26,957,700
Disposal at facility	89,859	cubic yard	$ 500	$ 44,929,500
Confirmatory analysis	365	each	$ 300	$ 109,500
Backfill	89,859	cubic yard	$ 9	$ 808,731
Backfill analysis	104	each	$ 500	$ 52,000
			Subtotal	$ 73,061,431

Table 12D
Alternative SC-3D - Excavation and Offsite Disposal
Onsite Resident
Shpack Landfill Superfund Site
Norton/Attleboro, Massachusetts

Remedial Cost Item	***No. of Units***	***Units***	***Unit Cost ($)***	***Cost ($)***
Ecological - "Inner Rung" Near Tongue Area				
Disposal characterization analysis	6	each	$ 500	$ 3,000
Gondola / transport	2,222	cubic yard	$ 300	$ 666,600
Disposal at facility	2,222	cubic yard	$ 500	$ 1,111,000
Confirmatory analysis	50	each	$ 300	$ 15,000
Backfill	2,222	cubic yard	$ 9	$ 19,998
Backfill analysis	3	each	$ 500	$ 1,500
Wetland restoration	0.7	acre	$ 75,000	$ 52,500
			Subtotal	$ 1,869,598
Ecological - Onsite Isolated Seasonal Wetlands				
Disposal characterization analysis	2	each	$ 500	$ 1,000
Gondola / transport	699	cubic yard	$ 300	$ 209,700
Disposal at facility	699	cubic yard	$ 500	$ 349,500
Confirmatory analysis	22	each	$ 300	$ 6,600
Backfill	699	cubic yard	$ 9	$ 6,291
Backfill analysis	1	each	$ 500	$ 500
Wetland restoration	3.2	acre	$ 75,000	$ 240,000
			Subtotal	$ 813,591
Install Public Waterline				
Coordination with stakeholders	1	ls	$ 12,000	$12,000
Residential connections	2	ea	$ 6,000	$12,000
New connection permit	2	ls	$ 3,300	$6,600
Tapping, materials, and road repair	2	ea	$ 2,500	$5,000
Abandon existing wells / plumb new connections	2	ea	$ 5,000	$10,000
Extend 10" water main	4,000	foot	$ 110	$440,000
Fire hydrant installation	2	ea	$ 10,000	$20,000
Extend waterline under railroad tracks	1	ls	$ 125,000	$125,000
			Subtotal	$630,600
Replace / Raise high-voltage transmission lines and towers				$ 1,000,000
Contractor labor (15%)				$ 11,796,220
Design (10%)				$ 7,864,150
Engineering and construction oversight (15%)				$ 11,796,220
Contingency (20%)				$ 15,735,290
			Subtotal	$ 48,191,880
			Subtotal Construction Costs	$ 126,868,000
B. Annual Operations, Maintenance, & Management Costs				
There are no operations, maintenance, and management costs associated with this alternative.				
			Subtotal	$ -
				$ -
C. Present Worth				
Number of Years of O&M	-			
				-
TOTAL COST				***$ 126,868,000***